TECHNICAL MEMORANDUM

SITE: CARRIER AIR
BREAK: 7.2 v1
OTHER:

NORTH REMEDIATION SITE CONFIRMATION SOIL BORINGS

Prepared for:

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Collierville, Tennessee

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January 20, 1997

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EXECUTIVE SUMMARY

Operation of the North Remediation Site (NRS) soil vapor extraction (SVE) system has resulted in nearly complete removal of trichloroethene (TCE) soil contamination from soil identified during the Remedial Investigation. Based on system discharge data, about 12,000 lbs of TCE have been removed by vapor extraction since January 1992, and less than 0.3 lb/day is currently being removed.

Results of confirmatory soil sampling on December 19 and 20, 1996, indicate that approximately 20 lbs, and no more than 120 lbs of TCE remain in this soil in the former lagoon area, and that TCE concentration in the soil is generally below the cleanup standard of 533 micrograms per kilogram (μg/kg). Soil sampling was conducted at four locations chosen to present the worst case, and at nine depths. Only two samples of 36 contained TCE concentration in excess of the soil cleanup goal. A singularly high result came in a sample collected at 15 feet below ground surface in the northwest corner of the NRS area.

Continued NRS operation is unnecessary, given the:

- Soil type at this interval: moist and dense with high clay content,
- Soil heterogeneity around this interval: sand with gravel; and
- Aggregate NRS operational results to date: significant early TCE mass removal, followed by a long period of slow removal, and the general absence of TCE in soil.

Since the volume of soil that, on average, exceeds the remedy performance goal (as indicated by the single sample result) is likely to be small, the mass of sorbed residual TCE is small, and of insignificant continued threat to groundwater quality in the Memphis Sand aquifer.

1.0 PURPOSE

This technical memorandum presents:

- A summary of initial soil sampling, and NRS operational data,
- The results of recent soil sampling at four soil borings at the NRS,
- An evaluation of the results, and
- A recommendation for action.

The NRS SVE system is one component of the remedy for the site, where the objective is to prevent further contamination of the Memphis Sand aquifer by TCE. The SVE system has operated almost continuously since January 1992. SVE continues at the main plant area, where a larger TCE spill is much closer to the entry point of shallow groundwater to the Memphis Sand.

Confirmatory sampling at the NRS was predicated by the site owner's plans to develop the area. As detailed in the following section, the NRS TCE removal rate has been steadily low for more than a year. The shallow saturated zone at the NRS was dewatered early in the operating period. These factors supported a decision to conduct soil sampling, with a goal of potentially decommissioning the system.

2.0 NRS SOIL VAPOR EXTRACTION

Setting

The NRS was installed in soil above the Jackson-Clayborn confining unit, at the location of a former (closed and removed) wastewater lagoon. As such, the limits of TCE-contaminated soil are well understood by inspection of aerial photography, as confirmed by soil sampling conducted during the remedial investigation (RI) of the site. Figure 1 is a plan of the 68-foot by 97-foot area in which vapor extraction wells were installed. The locations of RI and recent sampling event boreholes are included for reference.

Four borings were installed at the NRS area prior to system installation. The RI sample analytical results of these borings are shown in Table 1.

Table 1
RI Sample Results at NRS - TCE
August 1987 and January 1990
(in parts per billion)

Depth (ft)	Boring B-17	Boring B-18	Boring B-19	Boring B-40
0.5 to 2	15,000	ns	ns	ns
3 to 5	ns	16,000	840	1,890
8 to 10	ns	ns	ns	114
13 to 15	168,000	2,100	920	21
18 to 20	960	130	10	37
23 to 25	ns	ns	ns	80
28 to 30	ns	ns	ns	1,230

Notes:
ns - no sample collected (Borings B17, B18, and B19 were terminated at 20 ft).
Borings B17, B18, and B19 were sampled in August 1987, and boring B40 in January 1990.

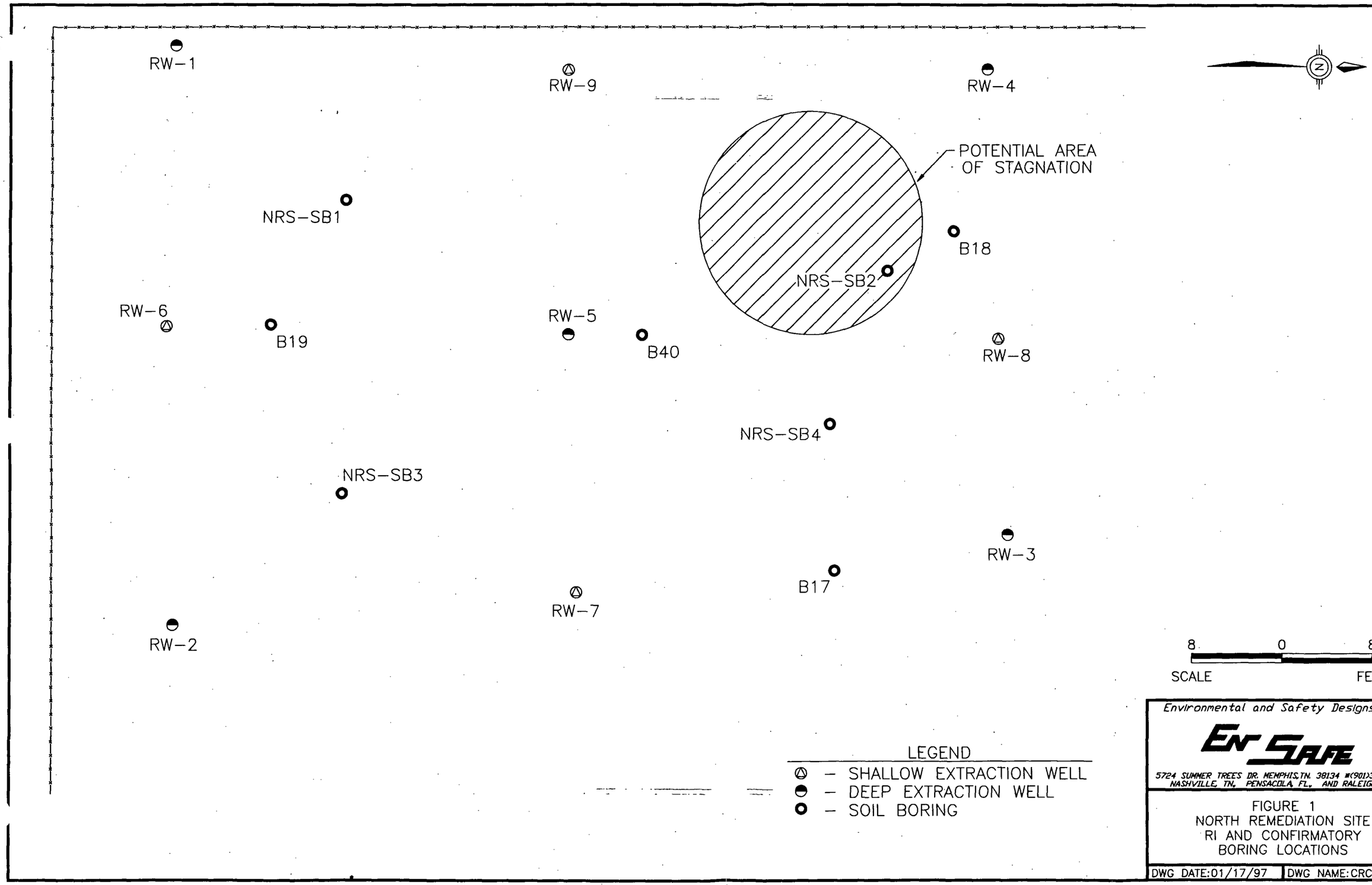

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FIGURE 1
NORTH REMEDIATION SITE
RI AND CONFIRMATORY
BORING LOCATIONS

DWG DATE:01/17/97 | DWG NAME:CRCB1048

The highest and most frequent detection of TCE occurred from 13 to 15 feet deep. This is a zone of clay underlain by more sandy soil. In general, lithology is described as:

- 0 to 15 ft Clayey silt grading to a sandy silt at 15 feet
- 15 to 20 ft Sandy clay grading to a sand at 20 feet
- 20 to 30 ft Sand with a trace of gravel
- 30 to 40 ft Sand and gravel with some clay
- 40 to 45 ft Sand and gravel, gravel becoming predominant

Boring logs from B17, B18, B19, and B40 are in Appendix A. It has been our experience at this site that the clay typically found near 15 feet below ground surface (bgs) has the highest capacity for sorption of TCE.

Extraction System Configuration and Operational Results

SVE at the NRS consists of an array of five, 4-inch diameter, deep extraction wells installed to 50 feet bgs, and four, 2-inch diameter, shallow extraction wells installed to 25 feet bgs. The deep wells (RW-1, -2, -3, -4, and -5) are screened from 30 to 50 feet bgs, and the shallow wells (RW-6, -7, -8, and -9) are screened from 15 to 25 feet bgs. The deep and shallow wells are separately manifolded and valved at the surface before joining a common pipe which is attached to the blower. This configuration allows separate extraction and monitoring of the deep and shallow well systems, along with the ability to monitor combined influent.

Analytical monitoring of the NRS SVE system began on start-up in January 1992. Combined influent concentrations during this first month exceeded 9,000 μg/L TCE with the highest concentrations greater than 25,000 μg/L TCE. Concentrations rapidly attenuated during the following months to less than 1,000 μg/L TCE and have currently averaged about 20 μg/L for the past 14 months. Since January 1994, the system has been sampled quarterly. Historical data of NRS SVE vapor sampling are summarized in Table 2.

Table 2
NRS SVE Analytical Data

Sample Date	Cumulative Days	TCE (µg/l)
01/10/92	1	30,500
01/11/92	2	25,888
01/13/92	4	15,139
01/14/92	5	18,818
01/15/92	6	12,777
01/16/92	7	15,800
01/20/92	11	25,100
01/22/92	13	12,847
01/24/92	15	10,200
01/29/92	20	9,970
01/31/92	22	9,130
02/02/92	24	9,035
02/21/92	43	951
03/26/92	76	957
04/06/92	87	620
12/02/93	693	1
01/24/94	743	340
03/31/94	803	97
06/27/94	893	165
10/20/94	1003	292
02/14/95	1123	70
06/23/95	1253	25
09/25/95	1343	9.57
12/07/95	1426	16.7
03/18/96	1529	43.1
06/24/96	1630	18.8
09/30/96	1725	15.5
12/10/96	1796	17.4

TCE removal rates at the NRS began in excess of 500 lbs/day, and declined to about 160 lbs/day in the first month. Current removal rates average less than 0.30 lb/day, and have remained at this asymptotic level since June 1995. Applying the vapor sample concentrations and extracted vapor mass to a calculation of cumulative removal yields a total of nearly 12,000 lbs of TCE removed since NRS start. Historical data used to calculate the cumulative removal total are presented in Appendix B.

In early 1994, system operation was interrupted (pulsed off and back on) and vapor was sampled to determine if TCE concentrations would rebound on restart. In general, this method assesses whether zones within the influence of SVE wells contain significant mass of contaminant, even when the current removal rate is slow. If extracted vapor concentration is high on restart, this indicates that the equilibrium concentration of pore space vapor is higher than the concentration under operating vacuum. This is an indication that significant residual contaminant remains, but its removal is controlled by diffusion out of the soil matrix into pore space that is subject to advection (flow) under vacuum stress.

In other words, when the vapor being collected at extraction wells contains only that contaminant desorbing from soil with residual contamination, extracted vapor concentration is typically low. During a pulsed operation test, while the system is off diffusion continues because of a concentration gradient between soil with residual contamination and pore space vapor. If the equilibrium concentration of pore space vapor is high in a zone, extracted vapor concentration is high immediately after reintroducing vacuum. If on restart the extracted vapor concentration is low, this indicates one of three possibilities:

- no zones of higher concentrations of residual TCE in soil remain,
- the zones are small in size relative to the area of vacuum influence, or
- the zones are isolated pneumatically from the extraction wells.

In any case, it is unlikely that continued operation of the SVE system will significantly reduce the residual contaminant mass in this situation.

This is apparently the current status with TCE at the NRS, based on operating history and results of pulsing. Graphs depicting removal rates of TCE over time are presented in Appendix B. It is clear from the data that continued operation of the NRS will not remove significant additional mass of TCE from this soil. The current removal rate is approximately 0.2 to 0.3 lbs/day. The removal rate in early 1994 did not rebound significantly when the system was left off for a period of time (December 2, 1993 to January 24, 1994). Removal rate, based on the results of a sample taken the day of restart (January 24) was in line with the general trend.

3.0 SOIL SAMPLING

Methodology

Soil was sampled in accordance with the *Final Design, Soil Vapor Extraction, Carrier Collierville Site, Appendix A - Performance Standards Verification Field Sampling and Analysis Plan (FSAP)*, June 6, 1995. Results were compared to the cleanup standard of 533 µg/kg TCE in soil as determined in the *Final Remedial Investigation Report, Collierville Site, Collierville, Tennessee*, March 27, 1992. This section summarizes the field sampling protocols employed during the confirmatory sampling event, which was based on the U.S. Environmental Protection Agency (USEPA)-approved FSAP. The four soil borings began on December 19, 1996, and were completed on December 20, 1996. Each boring was situated equidistant between surrounding SVE wells (see Figure 1). As presented in the FSAP, soil samples were to be collected using a 5-foot continuous split-spoon sampler; however, recent rain in the area saturated the ground and the rig was unable to enter the NRS area. The drilling subcontractor offered the use of an all-terrain vehicle (ATV) rig to complete the soil borings. The ATV rig had no 5-foot continuous sampler, but had a 2-foot, split-spoon sampler. Before commencing with the soil borings, USEPA was contacted to verify that sampling with the 2-foot spoon would be sufficient. EPA concurred that sampling could continue using the ATV rig and a 2-foot spoon.

Each boring was sampled every 5 feet, beginning at 5 feet bgs to a total depth of 45 feet. Samples were not recoverable below 45 feet due to gravel. Upon retrieval, the sampler was opened, and the soil screened for volatile organic compounds (VOCs) using a photoionization detector (PID). PID readings may not be representative of soil sample concentrations due to weather conditions during sampling (i.e., temperatures below freezing). A representative soil sample was collected and placed in two 2-ounce jars for laboratory analysis. Soil was placed into the sample jars using a precleaned stainless-steel spoon, and packed to the top so there was no headspace between the soil and the lid. Soil samples were analyzed by Solid Waste (SW) 846 Method 8240.

Results

Sample analysis results for TCE are summarized in Table 3 along with corresponding PID readings. The complete analytical data summary tables are presented in Appendix C.

Table 3
NRS Confirmatory Sample Results for TCE
and PID Readings
December 19 and 20, 1996

	Boring SB-1		Boring SB-2		Boring SB-3		Boring SB-4	
Depth (ft)	TCE (ppb)	PID (ppm)	TCE (ppb)	PID (ppm)	TCE (ppb)	PID (ppm)	TCE (ppb)	PID (pm)
5	6UJ	0	160	10	8	0	21	10
10	6UJ	0	11	10	17	5	30UJ	17
15	6UJ	0	130000J	>20	83	5	6U	0
20	45J	5	13	15	1100	>20	27UJ	0
25	5UJ	0	4J	10	10	5	5UJ	0
30	6UJ	0	10J	10	5U	0	26UJ	0
35	1J	10	43	12	210J	10	5U	0
40	2J	0	17	5	3J	0	5UJ	0
45	5UJ	0	58	5	130	10	5U	0
50	NR	NR	NR	NR	NR	NR	NR	NR

Notes:
U – the analyte was undetected at the reported concentration level
J – analyte detected, but at an estimated quantitation level
NR – signifies no sample recovery in split spoon (gravel)
ppb – parts per billion
ppm – parts per million

No TCE was detected in any trip, field, or equipment rinsate blank. Although boring logs were not constructed during this sampling event, visual inspection of soil in each split spoon were recorded. These observations, compared to logs of previous borings at the NRS (B17, B18, B19, and B40), indicate lithology does not vary over this small area.

Soil Sample Data Reduction

Summary sample statistics have been calculated and evaluated loosely following the methodology presented in *USEPA Publication No. SW-846, third edition, (Part III), Chapter 9 - Sampling Plan.* Although it is recognized that the sample locations are biased toward worst-case concentrations within the sample space — reflecting the dynamics of multi well extraction systems — this analysis can be used as a tool for drawing conservative conclusions about the true nature of the entire zone of soil impacted by TCE. Adding to conservatism, a probability level (confidence interval) of 95% was selected, as suggested by USEPA. That is, for the parameter contaminant of concern (TCE), a confidence interval (CI) is described within which the mean of the results occurs, if the sample were representative. The upper limit of the CI is then compared with the regulatory threshold (RT), in this case the soil cleanup standard.

On inspection of raw results, and with knowledge of the setting, it was determined that stratification of the data set is reasonable for two reasons:

- Soil-type heterogeneity: the sorptive capacity, and air permeability of the soil and thus the performance of SVE should, and apparently did differ between two zones. Surface to 15 feet deep is characterized by frequent TCE detection and silty/clay (higher surface area, lower permeability) soil. From 20 feet bgs to the clay at about 50 feet deep, soil type is predominantly more permeable, less sorptive sand and gravel, and the frequency of detection was lower;

- Bimodal distribution of the results: The single result at 15 feet bgs in SB-2 is so large relative to the remainder of the data, that it can be evaluated as an outlier. This is consistent with a hypothesis that the sample represents a soil zone that is pneumatically isolated from the SVE well network, likely due to soil heterogeneity.

Sample statistics were thus derived for these cases: deep, shallow with and without including the outlier, and overall with and without including the outlier. The calculations are presented in Appendix D. The upper CI was exceeded for the complete unedited data set. It is clear that the datum from SB-2 at 15 feet bgs is the cause. When the outlier is excluded, the shallow zone cleanup is complete. Results in the deep zone are well within criterion.

Soil Sample Data Evaluation

Dividing the NRS area into quadrants, the area in which SB2 was drilled comprises approximately 1,800 square feet (ft^2). Also, only the 5-foot interval sample at 15 feet bgs at SB2 resulted in such an elevated TCE concentration. Samples above and below this interval were well below the RT, as well as samples from borings which border SB2. At worst, only a relatively small volume soil (1,570 cubic feet versus a study area volume of 296,820 cubic feet) is considered to be above the RT. Considering that the boring location is biased, in that soil vapor velocities under the influence of a vapor extraction system are at their lowest midway between adjacent SVE wells, the volume truly contaminated at this level is likely to be smaller still. Nearer to the shallow extraction wells adjacent to this boring, subsurface vapor velocities and, thus, removal effectiveness induced by extraction, are relatively higher. Residual TCE concentration closer to the screened interval can be expected to be lower.

Remaining TCE Mass in NRS Soil

Even using the worst-case sample data, the residual TCE mass is insignificant compared to what already was removed and what remains at the main plant area of concern. Appendix E presents

residual TCE mass calculations using conservative and reasonable treatments of the soil sample results. Mass remaining in NRS area soil is approximately 20 lbs, and is no greater than 120 lbs, a small fraction of the more than 11,000 lbs removed. The significance of the remaining mass can be evaluated by comparison with assumptions used in modeling the fate and transport of TCE, conducted during the RI, and upon which the soil cleanup goal was derived.

During the RI, several assumption were made to establish the soil cleanup goal. These inputs to the modeling effort differ significantly from conditions at the NRS. Specifically, source area, source thickness, and distance to receptor for the main plant and NRS are summarized as follows.

Parameter	Main Plant Area	NRS
Source Area, in square meters	20,000	155
Source Thickness, in meters	15.2	1.5
Distance to Receptor, in meters	100	475

Across the site, soil type and percolation rates are similar. With the assumption that all shallow zone TCE enters the Memphis Sand in the southeast corner of the site, the reduction in source size has the effect of reducing the potential for mass contribution to the Memphis Sand. Distance to receptor (and fate of TCE through the vadose zone on its way to the shallow groundwater) will affect the opportunity for TCE concentrations to attenuate before reaching the Memphis Sand. Natural degradation of TCE in other areas at the site has greatly reduced what were once considered source areas. For example, when drilling the SVE pilot study wells in Area A (reference *Prefinal/Final Design, Soil Vapor Extraction*, July 29, 1994), all soil samples were below the cleanup goal of 533 μg/kg. Initial borings in this area during the RI included TCE concentrations results of 4,000 to 5,800 μg/kg at 0 to 5 feet bgs, and 4,500 μg/kg at 5 to 10 feet bgs. This natural attenuation in residual TCE concentrations will continue at the NRS.

4.0 CONCLUSIONS

The conclusions that can be drawn from the operational experience, and confirmatory sampling event at the NRS are as follows:

- About 12,000 lbs of TCE have been removed since NRS start in 1992.

- Less than 120 lbs (and likely 20 lbs) of TCE remain, and this is isolated near confirmatory boring SB-2 at the 15-foot depth interval.

- Insignificant additional mass will be removed by the NRS, if operation continues. Based on current soil, and the trend in extracted vapor TCE concentration data, no significant residual mass can be extracted through the SVE wells. Concentrations and removal rates have been near current levels for approximately 1.5 years.

- Soil characteristics in the zone of elevated remaining TCE concentration may explain why TCE was not extracted. High clay content provides for more sorption of the TCE and less air movement induced by vacuum extraction. Since this zone is underlain by more permeable sand, continued NRS operation will be ineffective.

- Most of the NRS soil space meets the cleanup goal of 533 μg/kg, with better than 95% confidence. Soil in the deep, sandy zone is well below criterion, as indicated by sample results from all borings at this depth interval.

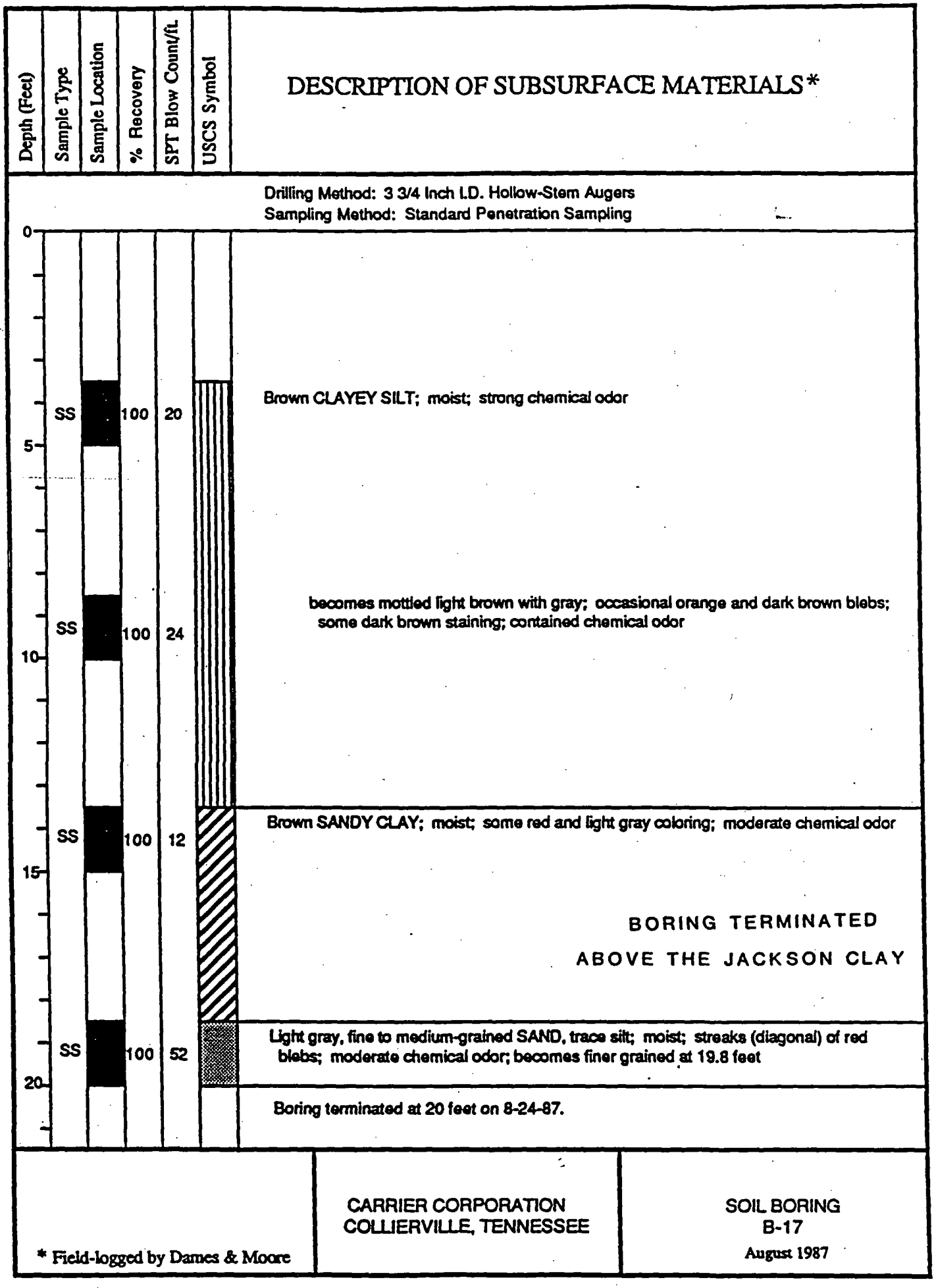
- The zone of soil above the cleanup goal is small relative the entire NRS soil space, and relative to the main plan area of interest, which was used to develop the goal. TCE contamination in main plant area is a more immediate threat to water quality in the Memphis Sand.

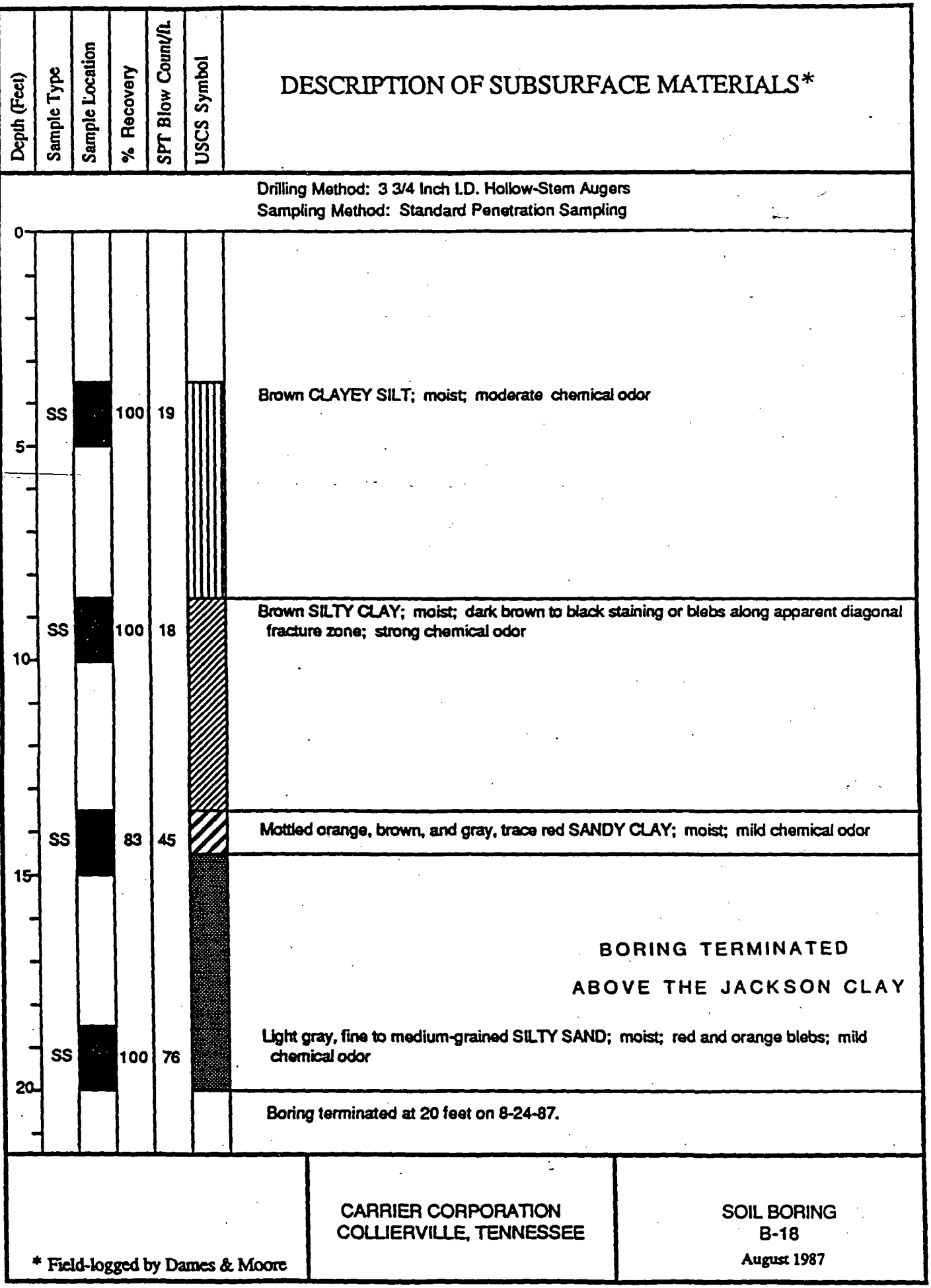
On this basis, the NRS system has met its objective of restoring soil quality that is protective of Memphis Sand groundwater. Further operation of the system may not result in significant mass removal, and it is unlikely that TCE concentration in the isolated zone near SB-2 can be brought to levels meeting the goal of 533 μg/kg.

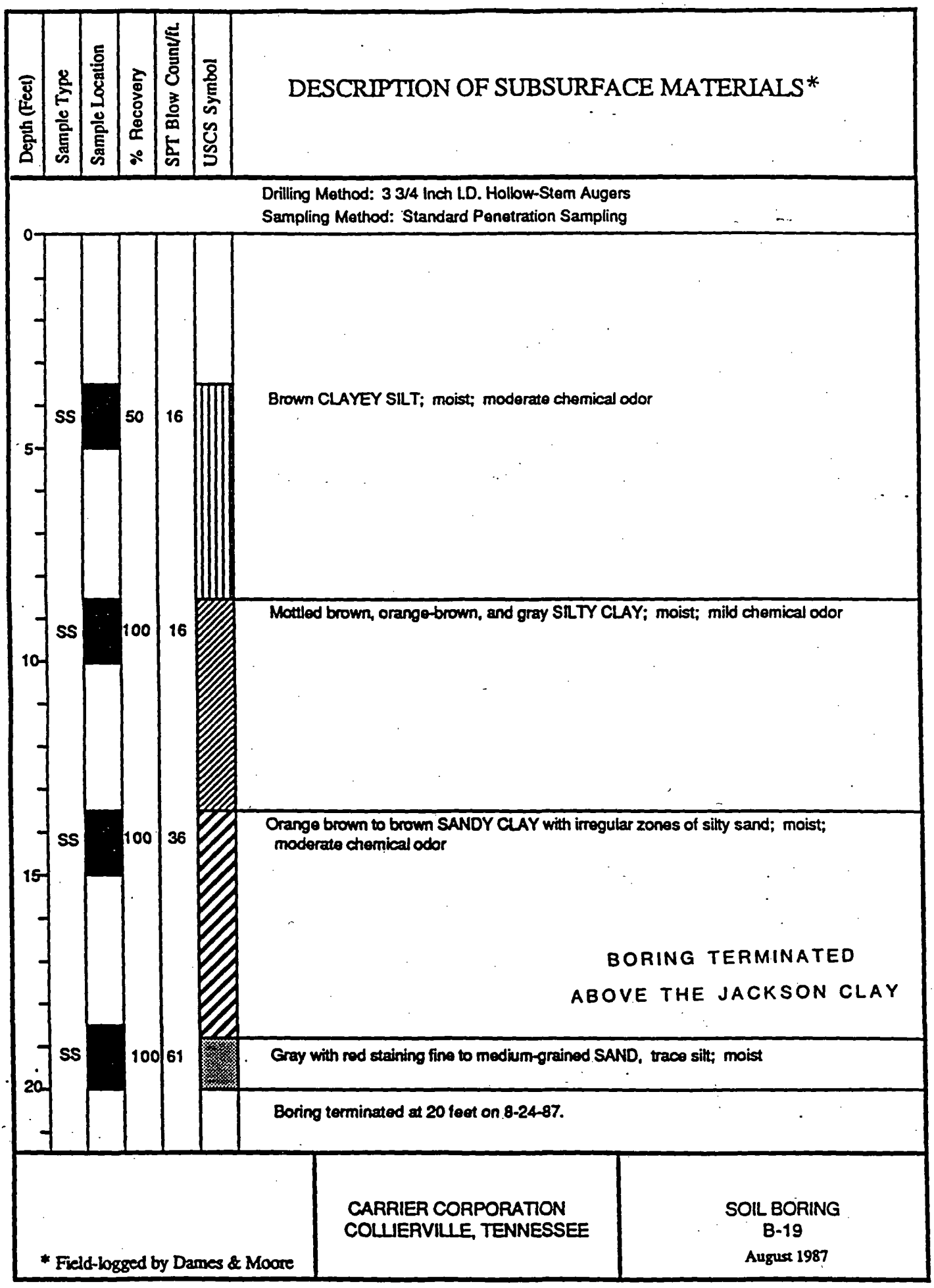
A

Appendix A

B17, B18, B19, And B40 Boring Logs


Depth (Feet)
Sample Type
Sample Location
% Recovery
SPT Blow Count/ft
USCS Symbol
DESCRIPTION OF SUBSURFACE MATERIALS*
Drilling Method: 3 3/4 Inch I.D. Hollow-Stem Augers
Sampling Method: Standard Penetration Sampling
0
5
10
15
20
SS
100
20
SS
100
24
SS
100
12
SS
100
52
Brown CLAYEY SILT; moist; strong chemical odor
becomes mottled light brown with gray; occasional orange and dark brown blebs; some dark brown staining; contained chemical odor
Brown SANDY CLAY; moist; some red and light gray coloring; moderate chemical odor
BORING TERMINATED
ABOVE THE JACKSON CLAY
Light gray, fine to medium-grained SAND, trace silt; moist; streaks (diagonal) of red blebs; moderate chemical odor; becomes finer grained at 19.8 feet
Boring terminated at 20 feet on 8-24-87.
* Field-logged by Dames & Moore
CARRIER CORPORATION
COLLIERVILLE, TENNESSEE
SOIL BORING
B-17
August 1987


Depth (Feet)
Sample Type
Sample Location
% Recovery
SPT Blow Count/ft.
USCS Symbol
DESCRIPTION OF SUBSURFACE MATERIALS*
Drilling Method: 3 3/4 Inch I.D. Hollow-Stem Augers
Sampling Method: Standard Penetration Sampling
0
5
10
15
20
SS
100
19
Brown CLAYEY SILT; moist; moderate chemical odor
SS
100
18
Brown SILTY CLAY; moist; dark brown to black staining or blebs along apparent diagonal fracture zone; strong chemical odor
SS
83
45
Mottled orange, brown, and gray, trace red SANDY CLAY; moist; mild chemical odor
BORING TERMINATED
ABOVE THE JACKSON CLAY
SS
100
76
Light gray, fine to medium-grained SILTY SAND; moist; red and orange blebs; mild chemical odor
Boring terminated at 20 feet on 8-24-87.
* Field-logged by Dames & Moore
CARRIER CORPORATION
COLLIERVILLE, TENNESSEE
SOIL BORING
B-18
August 1987


Depth (Feet)
Sample Type
Sample Location
% Recovery
SPT Blow Count/ft.
USCS Symbol
DESCRIPTION OF SUBSURFACE MATERIALS*
Drilling Method: 3 3/4 Inch I.D. Hollow-Stem Augers
Sampling Method: Standard Penetration Sampling
0
5
10
15
20
SS
50
16
Brown CLAYEY SILT; moist; moderate chemical odor
SS
100
16
Mottled brown, orange-brown, and gray SILTY CLAY; moist; mild chemical odor
SS
100
36
Orange brown to brown SANDY CLAY with irregular zones of silty sand; moist; moderate chemical odor
BORING TERMINATED
ABOVE THE JACKSON CLAY
SS
100
61
Gray with red staining fine to medium-grained SAND, trace silt; moist
Boring terminated at 20 feet on 8-24-87.
* Field-logged by Dames & Moore
CARRIER CORPORATION
COLLIERVILLE, TENNESSEE
SOIL BORING
B-19
August 1987

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	BLOWS/FT.	VAPOR CONC. (PPM)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE					SPARSE GRASS - DIRT
5	SS	75	18	42	MOTTLED LIGHT BROWN & GRAY SANDY SILT-SOME CLAY-NUMEROUS RUST ZONES THAT APPEAR TO BE SANDY, SOME ORGANIC SPECKS SCATTERED THROUGHOUT UPPER .3' AND LOWER .5'
10					
15	SS	92	39	30	MOTTLED LIGHT BROWN & GRAY SANDY SILT, OCCASIONAL RED SPOTS THROUGHOUT, EXTREMELY DENSE 14'-15'-PREDOMINATLY SANDY CLAY
	SS	75	55	30	16.5'-17.5' LIGHT GRAY WITH ABUNDANT RED SPECKS, SILTY SAND @ 17.5' BECOMES ORANGE & LIGHT GRAY MED SAND, WITH SOME IRON (RUST) STREAKS
20					
	SS	79	52	60	22'-22.9' FINE TO MEDIUM GRAINED, TANISH PINK MODERATELY SORTED SAND 22.9'-23.5' SAND BECOMES MORE RUST COLORED
25					
30	SS	88	58	2	30'-30.5' TAN & PINK FINE GRAINED SAND, SOME ORGANIC SPOTS @ 30.2' 30.5' BECOMES MOTTLED ORANGE & LIGHT GRAY COARSE GRAINED SAND & GRAVEL
35					SAMPLE B40-5 SPLIT WITH BLACK & VEATCH
40	SS	96	55	0.6	38'-38.5' LIGHT GRAY COARSE GRAINED SAND AND GRAVEL @ 38.5' BECOMES DARK ORANGE TO BROWN COARSE GRAINED SAND & GRAVEL GRADES TO A LIGHT ORANGE TAN WITH DEPTH
	SS	75	100	1.2	40'-40.4' COARSE GRAINED SAND & GRAVEL ORANGE TO BROWN, 40.4'-40.6' BECOMES SAND AND GRAVEL DARK BROWN-SOME CLAY, 40.6'-42' LIGHT ORANGE TO TAN MEDIUM TO COARSE GRAINED SAND WITH SOME GRAVEL, POORLY GRADED
45					FIRST SAMPLE 8" RECOVERED-DROVE SECOND SAMPLE 100% RECOVERY 46'-46.5' BROWNISH ORANGE COARSE GRAINED SAND & GRAVEL-WET
	SS	100	8	1.2	46.5'-48' MOTTLED ORANGEISH BROWN AND GRAY BLACK CLAY- APPEARS TO BE SOME SAND PRESENT IN THE CLAY, IRON CONCRETION @ 47' ← JACKSON CLAY
50					BORING TERMINATED @ 48.0'

Environmental and Safety Designs, Inc.

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B-40
COLLIERVILLE SITE
COLLIERVILLE, TN.

DWG DATE: 02/19/91 | DWG NAME: CARWELL4

1/22/90

Appendix B

NRS SVE Removal Rate Graphs And Historical Data

Carrier Collierville

NRS SVE Data '92 - '96

January 20, 1997

ppm @ 25 deg C, 1 atm

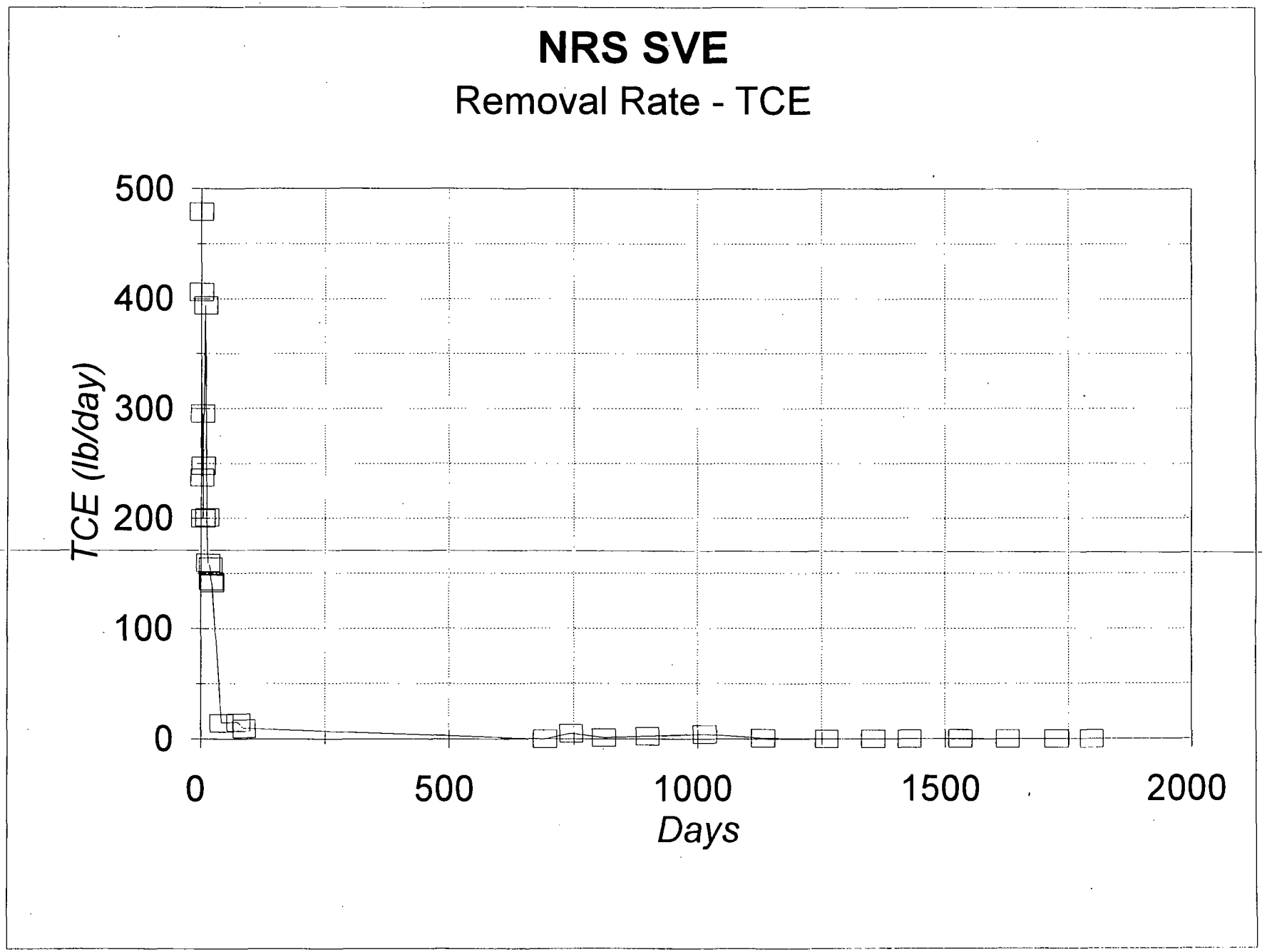
Sample Data

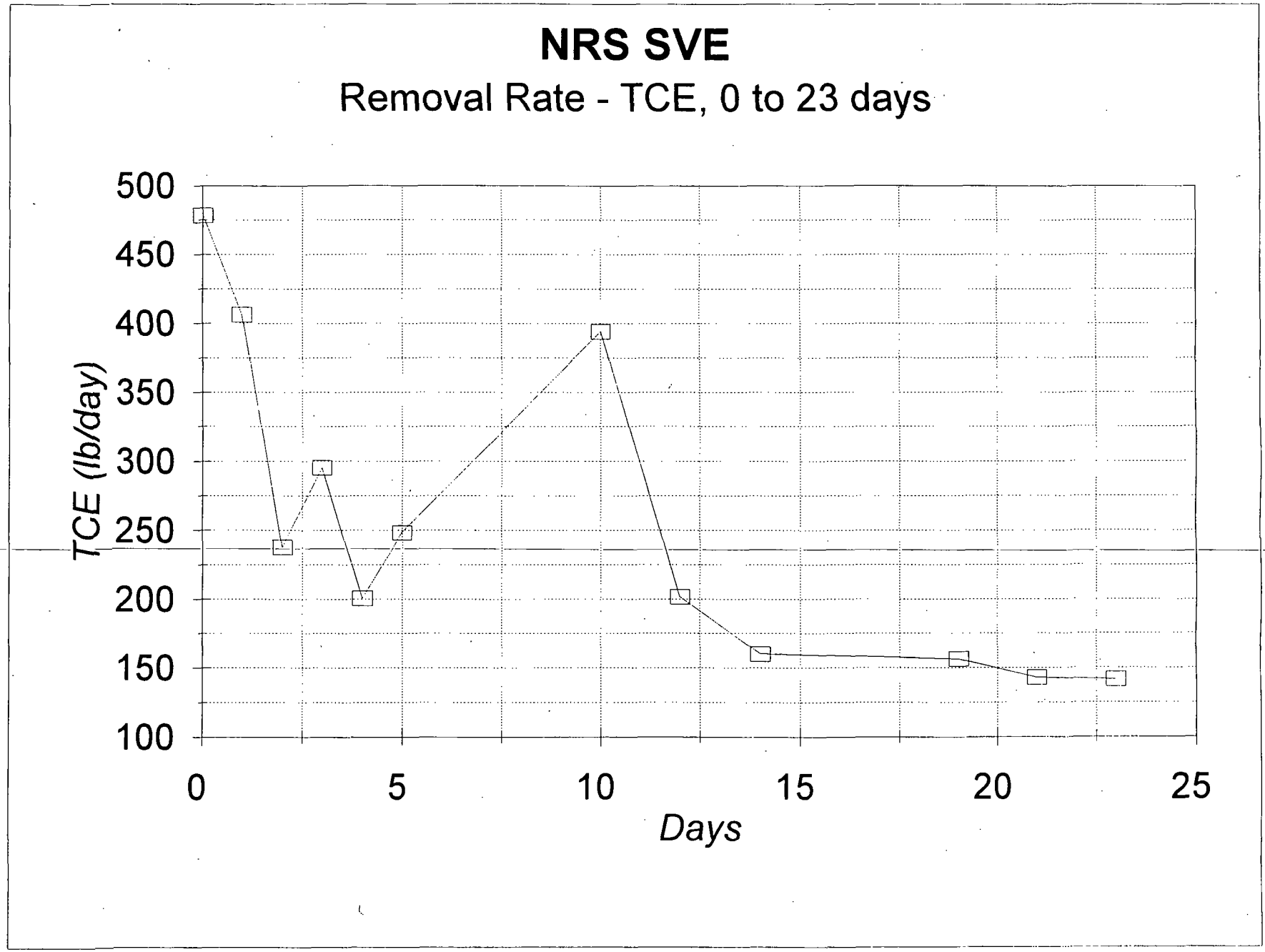
Sample Date	Cumul. Days	Deep (ug/l)	Deep (ppm)	Shallow (ug/l)	Shallow (ppm)	Combined (ug/l)	Combined (ppm)
10-Jan-92	0	no sample		no sample		30500	5664.155
11-Jan-92	1	no sample		no sample		25888	4807.660
13-Jan-92	2	no sample		no sample		15139	2811.464
14-Jan-92	3	no sample		no sample		18818	3494.691
15-Jan-92	4	no sample		no sample		12777	2372.817
16-Jan-92	5	no sample		no sample		15800	2934.218
20-Jan-92	10	no sample		no sample		25100	4661.321
22-Jan-92	12	no sample		no sample		12847	2385.816
24-Jan-92	14	no sample		no sample		10200	1894.242
29-Jan-92	19	no sample		no sample		9970	1851.529
31-Jan-92	21	no sample		no sample		9130	1695.532
02-Feb-92	23	no sample		no sample		9035	1677.890
21-Feb-92	42	no sample		no sample		951	176.610
26-Mar-92	76	no sample		no sample		957	177.724
06-Apr-92	87	no sample		no sample		620	115.140
02-Dec-93	692	128	23.771	0.6	0.111	1.3	0.241
24-Jan-94	745	48	8.914	1673	310.693	340	63.141
31-Mar-94	811	10	1.857	595	110.497	97	18.014
27-Jun-94	899	8.8	1.634	1020	189.424	165	30.642
20-Oct-94	1014	14	2.600	504	93.598	292	54.227
14-Feb-95	1131	3.5	0.650	110	20.428	70	13.000
23-Jun-95	1260	4.8	0.891	52	9.657	25	4.643
25-Sep-95	1354	3.38	0.628	49.7	9.230	9.57	1.777
07-Dec-95	1427	1.05	0.195	47.2	8.766	16.7	3.101
18-Mar-96	1529	7.15	1.328	68.7	12.758	43.1	8.004
24-Jun-96	1627	3.59	0.667	68.6	12.740	18.8	3.491
30-Sep-96	1725	10.9	2.024	68.1	12.647	15.5	2.879
10-Dec-96	1796	2.26	0.420	117	21.728	17.4	3.231

Removal Rates

rem. rate eqn is: (ug/L) x (1x10^-6g/ug) x (1440min/day) x (ft^3/min) x (28.3L/ft^3) x (lb/454g)

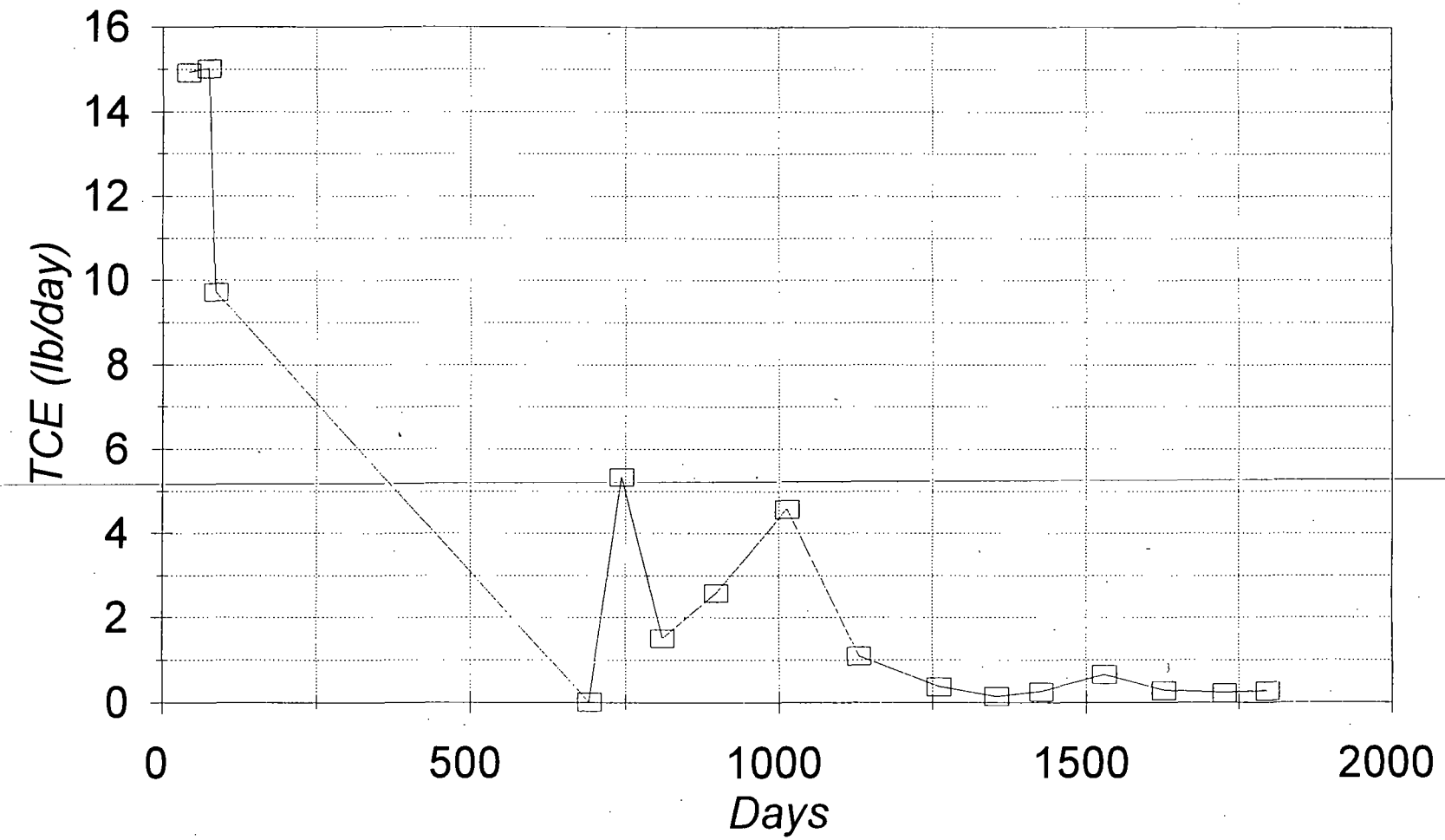
Date		Deep	Shallow	Combined			
10-Jan-92	0	no sample	no sample	479.105	Flowrate	=	175 combined
11-Jan-92	1	no sample	no sample	406.658	(cfm)		25 shallow
13-Jan-92	2	no sample	no sample	237.809			150 deep
14-Jan-92	3	no sample	no sample	295.600			
15-Jan-92	4	no sample	no sample	200.706			
16-Jan-92	5	no sample	no sample	248.192			
20-Jan-92	10	no sample	no sample	394.280			
22-Jan-92	12	no sample	no sample	201.805			
24-Jan-92	14	no sample	no sample	160.225			
29-Jan-92	19	no sample	no sample	156.612			
31-Jan-92	21	no sample	no sample	143.417			
02-Feb-92	23	no sample	no sample	141.925			
21-Feb-92	42	no sample	no sample	14.939			
26-Mar-92	76	no sample	no sample	15.033			
06-Apr-92	87	no sample	no sample	9.739			
02-Dec-93	692	1.723 lb/day	0.001 lb/day	0.020 lb/day			
24-Jan-94	745	0.646	3.754	5.341			
31-Mar-94	811	0.135	1.335	1.524			
27-Jun-94	899	0.118	2.289	2.592			
20-Oct-94	1014	0.189	1.131	4.587			
14-Feb-95	1131	0.047	0.247	1.100			
23-Jun-95	1260	0.065	0.117	0.393			
25-Sep-95	1354	0.046	0.112	0.150			
07-Dec-95	1427	0.014	0.106	0.262			
18-Mar-96	1529	0.096	0.154	0.677			
24-Jun-96	1627	0.048	0.154	0.295			
30-Sep-96	1725	0.147	0.153	0.243			
10-Dec-96	1796	0.030	0.263	0.273			


NRS SVE
Removal Rate - TCE
TCE (lb/day)
500
400
300
200
100
0
0
500
1000
1500
2000
Days


NRS SVE
Removal Rate - TCE, 0 to 23 days
TCE (lb/day)
500
450
400
350
300
250
200
150
100
0
5
10
15
20
25
Days

NRS SVE

Removal Rate - TCE, 42 days to present



Example Calculation for Mass Removed

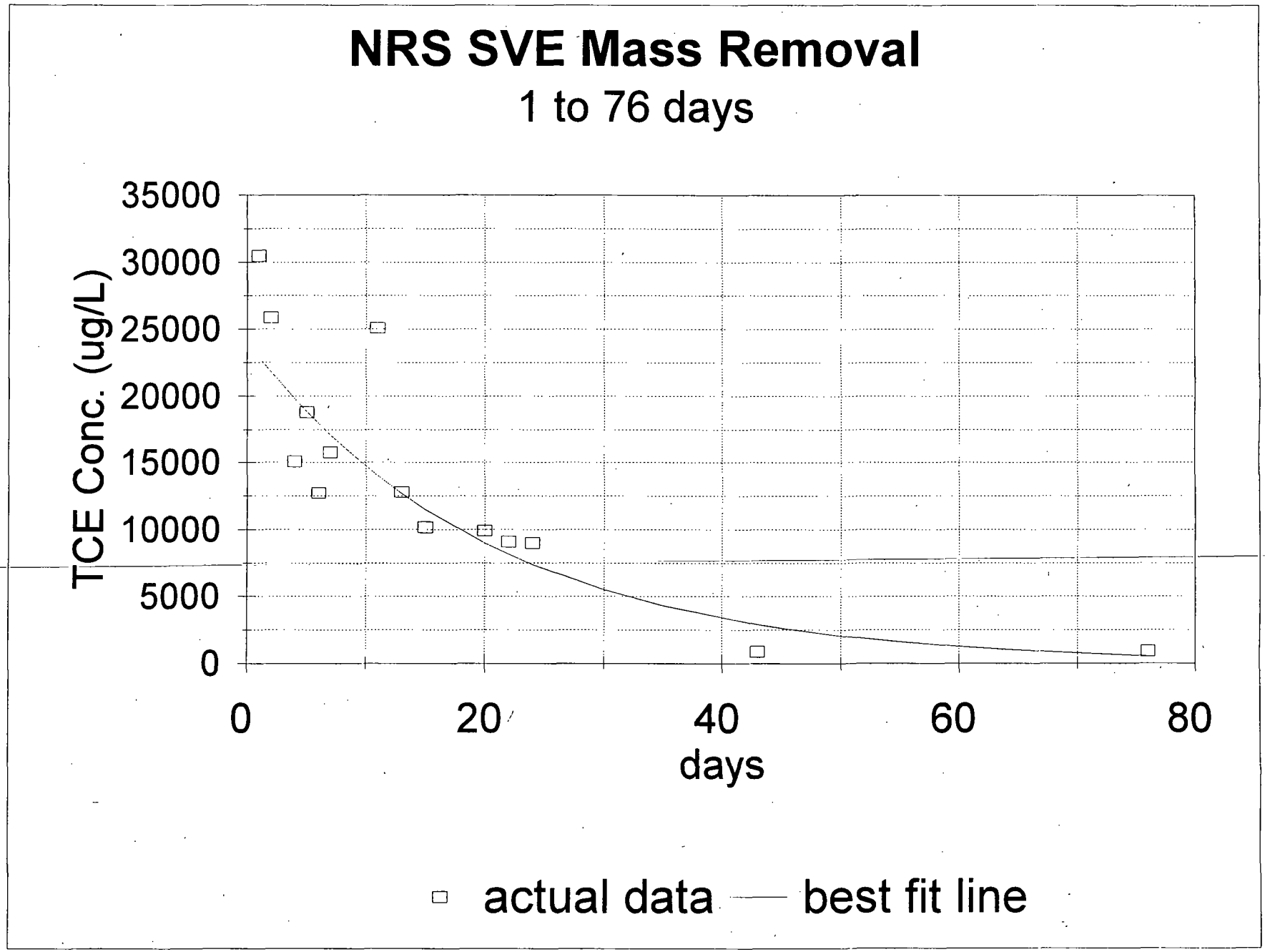
To calculate the amount of mass of TCE removed from the system, the soil vapor analytical data are graphed versus the cumulative time of system operation. Due to the significant amount removed during the first month and a half of operation, the data was fit to two curves; 1- for the first 76 days of operation, 2- from the 76th day to present. This break at 76 days was chosen due to the relatively close concentration on the 42nd day of operation (951 µg/L) and the 76th day (957 µg/L).

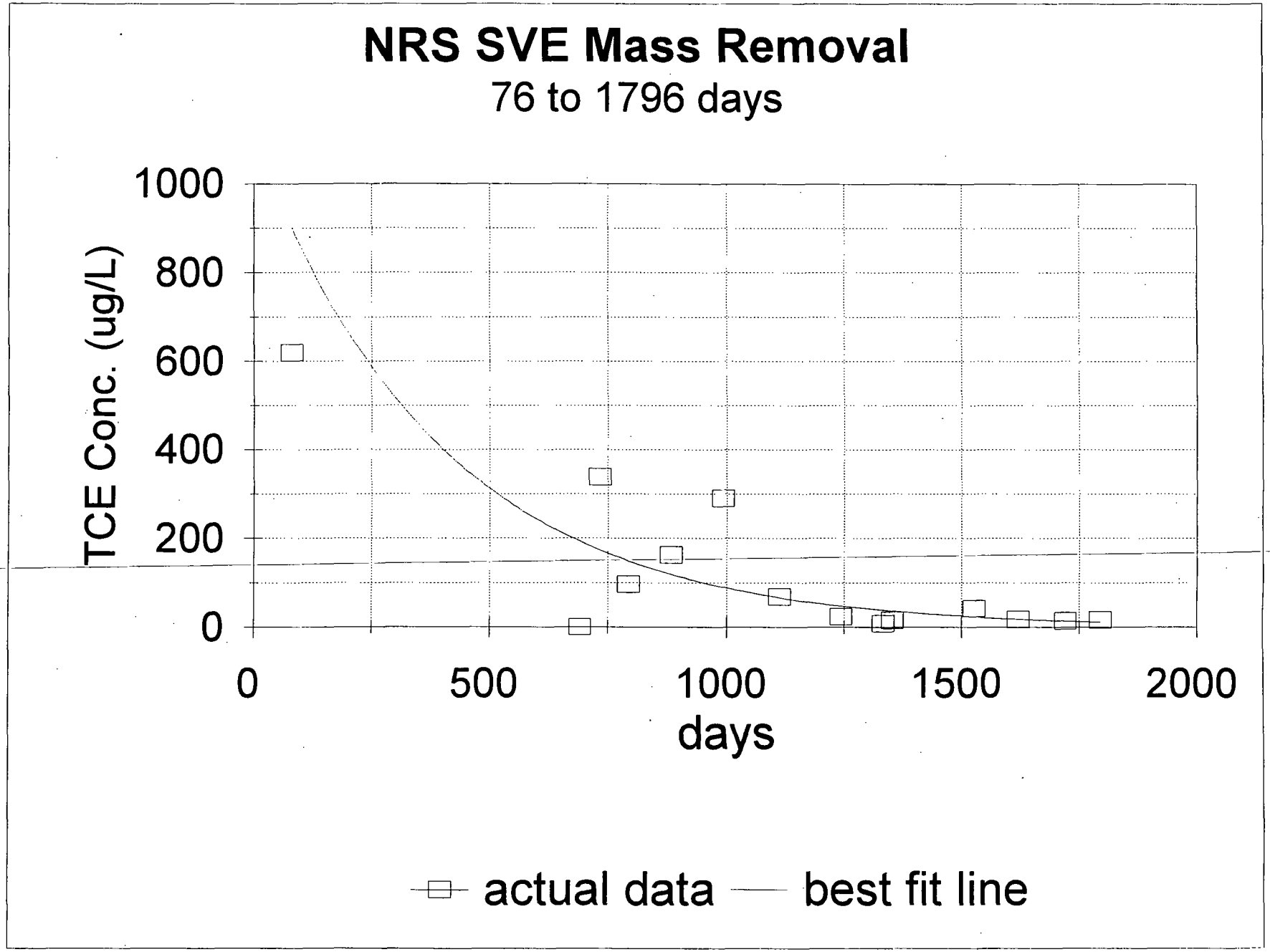
Example: a "best fit line" for the 1 to 76 day analytical data is graphed with actual data (see graph following this page). The area under this curve is found by integrating from 1 to 76, which results in:

$$\int_{1}^{76} 24095\exp^{-0.048998X}\,dX = 456{,}369\ \mu g/L\cdot days$$

Then simple unit conversions give the pounds of TCE removed during the time period:

$$\frac{456369\ \mu g/L\cdot days}{1} \times \frac{1x10^{-6} g}{\mu g} \times \frac{175\ ft^3}{\min} \times \frac{60\ \min}{hour} \times \frac{28.3\ L}{ft^3} \times \frac{lb}{454\ g} \times \frac{24\ hr}{day} \cong 7{,}000\ lbs$$


NRS SVE Mass Removal
1 to 76 days
TCE Conc. (ug/L)
35000
30000
25000
20000
15000
10000
5000
0
0
20
40
60
80
days
actual data
best fit line


NRS SVE Mass Removal
76 to 1796 days
TCE Conc. (ug/L)
1000
800
600
400
200
0
0
500
1000
1500
2000
days
actual data
best fit line

Appendix C

Analytical Data Summary Tables

An example of sample identification is as follows: **NRSSSB21416**: NRS for area identification - S for soil sample - SB2 for soil boring #2 - 1416 for sample interval, in this case 14 to 16 ft.

Forty-eight samples, including field rinsate, and trip blanks were collected at the Carrier Corporation Collierville, Tennessee site between December 18 and 20. 1996 and were analyzed for volatile organic compounds (VOCs) by the United States Environmental Protection Agency Office of Solid Waste and Emergency Response, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Third Edition, Method 8240. The overall quality of the data for soil samples collected at the Collierville site were evaluated based on method compliance, data usability, and scope-of-work satisfaction. Data validation revealed that most quality control (QC) parameters were within the control limits recommended in the method of analysis. The data was found to be acceptable for data interpretation.

Fourteen samples were analyzed after the holding time had lapsed. All results in these samples were qualified as estimated "J/UJ" according to the validation criteria established by *National Functional Guidelines for Organic Data Review*, February 1994, (Organic Functional Guidelines).

Methylene chloride and acetone were detected in one laboratory blank associated with the investigative samples. During the data evaluation process, methylene chloride and acetone were determined to be laboratory artifacts. Any methylene chloride and acetone concentrations less than 10 times the concentration of the associated blank were flagged as undetect "U" according to the data validation criteria in Organic Functional Guidelines.

Samples NRSSB41416, NRSSB41921, and NRSCB43436 were diluted because acetone exceeded the calibration range (flagged "E" by the laboratory). The values that exceeded the calibration range in the original sample were substituted by the diluted values. Substituted values are flagged ("D") to alert the data user that the results were taken from a secondary dilution. The remaining values in the diluted sample should not be used for interpretation and will not appear on the data tables. High acetone concentrations found in the samples could be attributed to the decontamination fluid isopropanol. This is supported by the poor field duplicate precision between samples NRSSB43436 and NRSCB43436. Acetone was detected in the primary sample and field duplicate at concentrations of 49 μg/kg and 590 μg/kg, respectively.

Sample NRSSB33436 was originally analyzed for VOCs within holding time requirements. The sample required reanalysis due to internal standard areas for 1,4-difluorobenzene and chlorobenzene-d_5 outside the acceptance criteria. The reanalysis demonstrated improved internal standard performance for 1,4-difluorobenzene and is reported on the data tables as the primary sample. Trichloroethene exceeded the calibration range in the reanalysis of sample NRSSB33436. The initial value of trichloroethene was substituted for the reanalysis.

Several samples were qualified as estimated "J/UJ" due to calibrations outside the QC criteria recommended in the method.

Samples NRSSB21416 and NRSCB21416, and NRSSB43436 and NRSCB43436 were collected as field duplicate pairs from the Collierville site. The relative percent difference for trichloroethene (161%) in field duplicate pair NRSSB21416 and NRSCB21416, and acetone (169%) in field duplicate pair NRSSB43436 and NRSCB43436 both exceeded the recommended QC limits. The original samples and the field duplicates only were qualified as estimated "J" for the outlier compounds.

CARRIER, COLLIERVILLE
CARRIER, NRS CLOSURE PHASE I, 12/96

SW846-VOA													
	SAMPLE ID ------->	NRS-S-B104-06		NRS-S-B109-11		NRS-S-B114-16		NRS-S-B119-21		NRS-S-B124-26		NRS-S-B129-31	
	ORIGINAL ID ----->	NRSSB10406		NRSSB10911		NRSSB11416		NRSSB11921		NRSSB12426		NRSSB12931	
	LAB SAMPLE ID --->	28048.01		28048.02		28048.03		28048.07		28048.09		28048.05	
	ID FROM REPORT -->	NRSSB10406		NRSSB10911		NRSSB11416		NRSSB11921		NRSSB12426		NRSSB12931	
	SAMPLE DATE ----->	12/18/96		12/18/96		12/18/96		12/18/96		12/18/96		12/18/96	
	DATE ANALYZED --->	12/30/96		12/27/96		12/27/96		12/27/96		12/27/96		12/27/96	
	MATRIX ---------->	Soil		Soil		Soil		Soil		Soil		Soil	
	UNITS ---------->	UG/KG		UG/KG		UG/KG		UG/KG		UG/KG		UG/KG	
CAS #	Parameter	28048	VAL	28048	VAL	28048	VAL	28048	VAL	28048	VAL	28048	VAL
74-87-3	Chloromethane	12.	UJ	12.	UJ	11.	UJ	11.	UJ	10.	UJ	11.	UJ
74-83-9	Bromomethane	12.	UJ	12.	UJ	11.	UJ	11.	UJ	10.	UJ	11.	UJ
75-01-4	Vinyl chloride	12.	UJ	12.	UJ	11.	UJ	11.	UJ	10.	UJ	11.	UJ
75-00-3	Chloroethane	12.	UJ	12.	UJ	11.	UJ	11.	UJ	10.	UJ	11.	UJ
75-09-2	Methylene chloride	3.	J	10.	J	12.	J	24.	J	25.	J	25.	J
67-64-1	Acetone	12.	UJ	19.	J	16.	J	19.	J	19.	J	23.	J
75-15-0	Carbon disulfide	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
75-35-4	1,1-Dichloroethene	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
75-34-3	1,1-Dichloroethane	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
540-59-0	1,2-Dichloroethene (total)	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
67-66-3	Chloroform	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
107-06-2	1,2-Dichloroethane	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
78-93-3	2-Butanone (MEK)	12.	UJ	12.	UJ	11.	UJ	11.	UJ	10.	UJ	11.	UJ
71-55-6	1,1,1-Trichloroethane	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
56-23-5	Carbon tetrachloride	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
75-27-4	Bromodichloromethane	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
78-87-5	1,2-Dichloropropane	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
10061-01-5	cis-1,3-Dichloropropene	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
79-01-6	Trichloroethene	6.	UJ	6.	UJ	6.	UJ	45.	J	5.	UJ	6.	UJ
124-48-1	Dibromochloromethane	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
79-00-5	1,1,2-Trichloroethane	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
71-43-2	Benzene	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
10061-02-6	trans-1,3-Dichloropropene	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
75-25-2	Bromoform	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
108-10-1	4-Methyl-2-Pentanone (MIBK)	12.	UJ	12.	UJ	11.	UJ	11.	UJ	10.	UJ	11.	UJ
591-78-6	2-Hexanone	12.	UJ	12.	UJ	11.	UJ	11.	UJ	10.	UJ	11.	UJ
127-18-4	Tetrachloroethene	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
79-34-5	1,1,2,2-Tetrachloroethane	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
108-88-3	Toluene	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
108-90-7	Chlorobenzene	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
100-41-4	Ethylbenzene	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
100-42-5	Styrene	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
1330-20-7	Xylene (total)	6.	UJ	6.	UJ	6.	UJ	5.	UJ	5.	UJ	6.	UJ
108-05-4	Vinyl acetate	12.	UJ	12.	UJ	11.	UJ	11.	UJ	10.	UJ	11.	UJ
110-75-8	2-Chloroethyl Vinyl Ether	12.	UJ	12.	UJ	11.	UJ	11.	UJ	10.	UJ	11.	UJ

*** Validation Complete ***

CARRIER, COLLIERVILLE
CARRIER, NRS CLOSURE PHASE I, 12/96

SW846-VOA						
SAMPLE ID ------>	NRS-S-B134-36	NRS-S-B139-41	NRS-S-B144-46	NRS-S-B204-06	NRS-S-B209-11	NRS-S-B214-16
ORIGINAL ID ----->	NRSSB13436	NRSSB13941	NRSSB14446	NRSSB20406	NRSSB20911	NRSSB21416
LAB SAMPLE ID --->	28048.06	28048.08	28048.04	28043.02	28043.01	28043.03
ID FROM REPORT -->	NRSSB13436	NRSSB13941	NRSSB14446	NRSSB20406	NRSSB20911	NRSSB21416
SAMPLE DATE ----->	12/18/96	12/18/96	12/18/96	12/19/96	12/19/96	12/19/96
DATE ANALYZED --->	12/27/96	12/27/96	12/27/96	12/23/96	12/23/96	12/23/96
MATRIX ---------->	Soil	Soil	Soil	Soil	Soil	Soil
UNITS ---------->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG

CAS #	Parameter	28048	VAL	28048	VAL	28048	VAL	28043	VAL	28043	VAL	28043	VAL
74-87-3	Chloromethane	11.	UJ	10.	UJ	10.	UJ	12.	U	12.	U	14000.	U
74-83-9	Bromomethane	11.	UJ	10.	UJ	10.	UJ	12.	U	12.	U	14000.	U
75-01-4	Vinyl chloride	11.	UJ	10.	UJ	10.	UJ	12.	U	12.	U	14000.	U
75-00-3	Chloroethane	11.	UJ	10.	UJ	10.	UJ	12.	U	12.	U	14000.	U
75-09-2	Methylene chloride	24.	J	27.	J	6.	J	6.	U	6.	U	7400.	U
67-64-1	Acetone	4.	J	18.	J	14.	J	5.	J	64.		14000.	U
75-15-0	Carbon disulfide	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
75-35-4	1,1-Dichloroethene	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
75-34-3	1,1-Dichloroethane	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
540-59-0	1,2-Dichloroethene (total)	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
67-66-3	Chloroform	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
107-06-2	1,2-Dichloroethane	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
78-93-3	2-Butanone (MEK)	11.	UJ	10.	UJ	10.	UJ	12.	U	12.	U	14000.	U
71-55-6	1,1,1-Trichloroethane	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
56-23-5	Carbon tetrachloride	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
75-27-4	Bromodichloromethane	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
78-87-5	1,2-Dichloropropane	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
10061-01-5	cis-1,3-Dichloropropene	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
79-01-6	Trichloroethene	1.	J	2.	J	5.	UJ	160.		11.		130000.	J
124-48-1	Dibromochloromethane	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
79-00-5	1,1,2-Trichloroethane	5.	UJ	5.	UJ	5.	UJ	6.	J	6.	U	7400.	U
71-43-2	Benzene	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
10061-02-6	trans-1,3-Dichloropropene	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
75-25-2	Bromoform	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	UJ
108-10-1	4-Methyl-2-Pentanone (MIBK)	11.	UJ	10.	UJ	10.	UJ	12.	U	12.	U	14000.	U
591-78-6	2-Hexanone	11.	UJ	10.	UJ	10.	UJ	12.	U	12.	U	14000.	U
127-18-4	Tetrachloroethene	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
79-34-5	1,1,2,2-Tetrachloroethane	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
108-88-3	Toluene	5.	UJ	5.	UJ	5.	UJ	2.	J	6.	U	7400.	U
108-90-7	Chlorobenzene	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
100-41-4	Ethylbenzene	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
100-42-5	Styrene	5.	UJ	5.	UJ	5.	UJ	6.	U	6.	U	7400.	U
1330-20-7	Xylene (total)	5.	UJ	5.	UJ	5.	UJ	5.	J	6.	U	7400.	U
108-05-4	Vinyl acetate	11.	UJ	10.	UJ	10.	UJ	12.	U	12.	U	14000.	U
110-75-8	2-Chloroethyl Vinyl Ether	11.	UJ	10.	UJ	10.	UJ	12.	U	12.	U	14000.	U

*** Validation Complete ***

CARRIER, COLLIERVILLE
CARRIER, NRS CLOSURE PHASE I, 12/96

SW846-VOA	SAMPLE ID ------->	NRS-C-B214-16		NRS-S-B219-21		NRS-S-B224-26		NRS-S-B229-31		NRS-S-B234-36		NRS-S-B239-41	
	ORIGINAL ID ----->	NRSCB21416		NRSSB21921		NRSSB22426		NRSSB22931		NRSSB23436		NRSSB23941	
	LAB SAMPLE ID --->	28043.04		28043.10		28043.08		28043.05		28043.09		28043.06	
	ID FROM REPORT -->	NRSCB21416		NRSSB21921		NRSSB22426		NRSSB22931		NRSSB23436		NRSSB23941	
	SAMPLE DATE ----->	12/19/96		12/19/96		12/19/96		12/19/96		12/19/96		12/19/96	
	DATE ANALYZED --->	12/23/96		12/20/96		12/20/96		12/23/96		12/23/96		12/20/96	
	MATRIX ---------->	Soil		Soil		Soil		Soil		Soil		Soil	
	UNITS ---------->	UG/KG		UG/KG		UG/KG		UG/KG		UG/KG		UG/KG	
CAS #	Parameter	28043	VAL	28043	VAL	28043	VAL	28043	VAL	28043	VAL	28043	VAL
74-87-3	Chloromethane	1400.	U	11.	U	10.	U	22.	U	58.	U	10.	U
74-83-9	Bromomethane	1400.	U	11.	U	10.	U	22.	U	58.	U	10.	U
75-01-4	Vinyl chloride	1400.	U	11.	U	10.	U	22.	U	58.	U	10.	U
75-00-3	Chloroethane	1400.	U	11.	U	10.	U	22.	U	58.	U	10.	U
75-09-2	Methylene chloride	710.	U	22.	U	23.	U	11.	U	29.	U	23.	U
67-64-1	Acetone	1400.	U	70.	U	120.	U	260.		710.		140.	
75-15-0	Carbon disulfide	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
75-35-4	1,1-Dichloroethene	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
75-34-3	1,1-Dichloroethane	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
540-59-0	1,2-Dichloroethene (total)	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
67-66-3	Chloroform	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
107-06-2	1,2-Dichloroethane	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
78-93-3	2-Butanone (MEK)	1400.	U	11.	U	10.	U	22.	U	58.	U	10.	U
71-55-6	1,1,1-Trichloroethane	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
56-23-5	Carbon tetrachloride	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
75-27-4	Bromodichloromethane	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
78-87-5	1,2-Dichloropropane	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
10061-01-5	cis-1,3-Dichloropropene	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
79-01-6	Trichloroethene	14000.	J	13.		4.	J	10.	J	43.		17.	
124-48-1	Dibromochloromethane	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
79-00-5	1,1,2-Trichloroethane	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
71-43-2	Benzene	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
10061-02-6	trans-1,3-Dichloropropene	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
75-25-2	Bromoform	710.	UJ	6.	U	5.	U	11.	U	29.	U	5.	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	1400.	U	11.	U	10.	U	22.	U	58.	U	10.	U
591-78-6	2-Hexanone	1400.	U	11.	U	10.	U	22.	U	58.	U	10.	U
127-18-4	Tetrachloroethene	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
79-34-5	1,1,2,2-Tetrachloroethane	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
108-88-3	Toluene	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
108-90-7	Chlorobenzene	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
100-41-4	Ethylbenzene	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
100-42-5	Styrene	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
1330-20-7	Xylene (total)	710.	U	6.	U	5.	U	11.	U	29.	U	5.	U
108-05-4	Vinyl acetate	1400.	U	11.	U	10.	U	22.	U	58.	U	10.	U
110-75-8	2-Chloroethyl Vinyl Ether	1400.	U	11.	U	10.	U	22.	U	58.	U	10.	U

*** Validation Complete ***

CARRIER, COLLIERVILLE
CARRIER, NRS CLOSURE PHASE I, 12/96

SW846-VOA						
SAMPLE ID ------>	NRS-S-B244-46	NRS-S-B304-06	NRS-S-B309-11	NRS-S-B314-16	NRS-S-B319-21	NRS-S-B324-26
ORIGINAL ID ----->	NRSSB24446	NRSSB30406	NRSSB30911	NRSSB31416	NRSSB31921	NRSSB32426
LAB SAMPLE ID --->	28043.07	28043.18	28043.14	28043.16	28043.15	28043.13
ID FROM REPORT -->	NRSSB24446	NRSSB30406	NRSSB30911	NRSSB31416	NRSSB31921	NRSSB32426
SAMPLE DATE ----->	12/19/96	12/19/96	12/19/96	12/19/96	12/19/96	12/19/96
DATE ANALYZED --->	12/20/96	12/23/96	12/23/96	12/26/96	12/23/96	12/26/96
MATRIX ---------->	Soil	Soil	Soil	Soil	Soil	Soil
UNITS ---------->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG

CAS #	Parameter	28043	VAL	28043	VAL	28043	VAL	28043	VAL	28043	VAL	28043	VAL
74-87-3	Chloromethane	10.	U	12.	U	12.	U	11.	U	54.	U	12.	U
74-83-9	Bromomethane	10.	U	12.	U	12.	U	11.	U	54.	U	12.	U
75-01-4	Vinyl chloride	10.	U	12.	U	12.	U	11.	U	54.	U	12.	U
75-00-3	Chloroethane	10.	U	12.	U	12.	U	11.	U	54.	U	12.	U
75-09-2	Methylene chloride	21.	U	6.	U	6.	U	5.	J	27.	U	6.	U
67-64-1	Acetone	130.	U	12.	U	6.	J	28.	J	54.	U	37.	J
75-15-0	Carbon disulfide	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
75-35-4	1,1-Dichloroethene	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
75-34-3	1,1-Dichloroethane	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
540-59-0	1,2-Dichloroethene (total)	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
67-66-3	Chloroform	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
107-06-2	1,2-Dichloroethane	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
78-93-3	2-Butanone (MEK)	10.	U	12.	U	12.	U	11.	U	54.	U	12.	U
71-55-6	1,1,1-Trichloroethane	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
56-23-5	Carbon tetrachloride	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
75-27-4	Bromodichloromethane	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
78-87-5	1,2-Dichloropropane	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
10061-01-5	cis-1,3-Dichloropropene	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
79-01-6	Trichloroethene	58.		8.		17.		83.		1100.		10.	
124-48-1	Dibromochloromethane	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
79-00-5	1,1,2-Trichloroethane	5.	U	2.	J	6.	U	6.	U	27.	U	6.	U
71-43-2	Benzene	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
10061-02-6	trans-1,3-Dichloropropene	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
75-25-2	Bromoform	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	10.	U	12.	U	12.	U	11.	U	54.	U	12.	U
591-78-6	2-Hexanone	10.	U	12.	U	12.	U	11.	U	54.	U	12.	U
127-18-4	Tetrachloroethene	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
79-34-5	1,1,2,2-Tetrachloroethane	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
108-88-3	Toluene	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
108-90-7	Chlorobenzene	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
100-41-4	Ethylbenzene	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
100-42-5	Styrene	5.	U	6.	U	6.	U	6.	U	27.	U	6.	U
1330-20-7	Xylene (total)	5.	U	6.	U	6.	U	2.	J	27.	U	6.	U
108-05-4	Vinyl acetate	10.	U	12.	U	12.	U	11.	U	54.	U	12.	U
110-75-8	2-Chloroethyl Vinyl Ether	10.	U	12.	U	12.	U	11.	U	54.	U	12.	U

*** Validation Complete ***

CARRIER, COLLIERVILLE
CARRIER, NRS CLOSURE PHASE I, 12/96

SW846-VOA													
	SAMPLE ID ------>	NRS-S-B329-31		NRS-S-B334-36 RE		NRS-S-B339-41		NRS-S-B344-46		NRS-S-B404-06		NRS-S-B409-11	
	ORIGINAL ID ----->	NRSSB32931		NRSSB33436		NRSSB33941		NRSSB34446		NRSSB40406		NRSSB40911	
	LAB SAMPLE ID --->	28043.20		28043.17		28043.21		28043.19		28048.17		28048.14	
	ID FROM REPORT -->	NRSSB32931		NRSSB33436		NRSSB33941		NRSSB34446		NRSSB40406		NRSSB40911	
	SAMPLE DATE ----->	12/19/96		12/19/96		12/19/96		12/19/96		12/19/96		12/19/96	
	DATE ANALYZED --->	12/23/96		12/23/96		12/23/96		12/23/96		12/26/96		12/30/96	
	MATRIX ---------->	Soil		Soil		Soil		Soil		Soil		Soil	
	UNITS ---------->	UG/KG		UG/KG		UG/KG		UG/KG		UG/KG		UG/KG	
CAS #	Parameter	28043	VAL	28043	VAL	28043	VAL	28043	VAL	28048	VAL	28048	VAL
74-87-3	Chloromethane	11.	U	10.	U	10.	U	13.	U	20.	U	61.	UJ
74-83-9	Bromomethane	11.	U	10.	U	10.	U	13.	U	20.	U	61.	UJ
75-01-4	Vinyl chloride	11.	U	10.	U	10.	U	13.	U	20.	U	61.	UJ
75-00-3	Chloroethane	11.	U	10.	U	10.	U	13.	U	20.	U	61.	UJ
75-09-2	Methylene chloride	5.	U	5.	U	5.	U	3.	J	10.	U	13.	J
67-64-1	Acetone	7.	J	10.	U	9.	J	13.	U	350.	J	1200.	J
75-15-0	Carbon disulfide	5.	U	5.	U	5.	U	6.	U	10.	U	30.	UJ
75-35-4	1,1-Dichloroethene	5.	U	5.	U	5.	U	6.	U	10.	U	30.	UJ
75-34-3	1,1-Dichloroethane	5.	U	5.	U	5.	U	6.	U	10.	U	30.	UJ
540-59-0	1,2-Dichloroethene (total)	5.	U	5.	U	5.	U	3.	J	10.	U	30.	UJ
67-66-3	Chloroform	5.	U	5.	U	5.	U	6.	U	10.	U	30.	UJ
107-06-2	1,2-Dichloroethane	5.	U	5.	U	5.	U	6.	U	10.	U	30.	UJ
78-93-3	2-Butanone (MEK)	11.	U	10.	U	10.	U	13.	U	20.	U	61.	UJ
71-55-6	1,1,1-Trichloroethane	5.	U	5.	U	5.	U	6.	U	10.	U	30.	UJ
56-23-5	Carbon tetrachloride	5.	U	5.	U	5.	U	6.	U	10.	U	30.	UJ
75-27-4	Bromodichloromethane	5.	U	5.	U	5.	U	6.	U	10.	U	30.	UJ
78-87-5	1,2-Dichloropropane	5.	U	5.	U	5.	U	6.	U	10.	U	30.	UJ
10061-01-5	cis-1,3-Dichloropropene	5.	U	5.	U	5.	U	6.	U	10.	U	30.	UJ
79-01-6	Trichloroethene	5.	U	210.	J	3.	J	130.		21.		30.	UJ
124-48-1	Dibromochloromethane	5.	U	5.	U	5.	U	6.	U	10.	U	30.	UJ
79-00-5	1,1,2-Trichloroethane	5.	U	5.	U	5.	U	2.	J	10.	U	30.	UJ
71-43-2	Benzene	5.	U	5.	U	5.	U	6.	U	10.	U	30.	UJ
10061-02-6	trans-1,3-Dichloropropene	5.	U	5.	U	5.	U	6.	U	10.	U	30.	UJ
75-25-2	Bromoform	5.	U	5.	U	5.	U	6.	U	10.	U	30.	UJ
108-10-1	4-Methyl-2-Pentanone (MIBK)	11.	U	10.	UJ	10.	U	13.	U	20.	U	61.	UJ
591-78-6	2-Hexanone	11.	U	10.	UJ	10.	U	13.	U	20.	U	61.	UJ
127-18-4	Tetrachloroethene	5.	U	5.	UJ	5.	U	6.	U	10.	U	30.	UJ
79-34-5	1,1,2,2-Tetrachloroethane	5.	U	5.	UJ	5.	U	6.	U	10.	U	30.	UJ
108-88-3	Toluene	5.	U	2.	J	5.	U	6.	U	10.	U	30.	UJ
108-90-7	Chlorobenzene	5.	U	5.	UJ	5.	U	6.	U	10.	U	30.	UJ
100-41-4	Ethylbenzene	5.	U	5.	UJ	5.	U	6.	U	10.	U	30.	UJ
100-42-5	Styrene	5.	U	5.	UJ	5.	U	6.	U	10.	U	30.	UJ
1330-20-7	Xylene (total)	5.	U	5.	J	5.	U	6.	U	10.	U	30.	UJ
108-05-4	Vinyl acetate	11.	U	10.	U	10.	U	13.	U	20.	U	61.	UJ
110-75-8	2-Chloroethyl Vinyl Ether	11.	U	10.	U	10.	U	13.	U	20.	U	61.	UJ

*** Validation Complete ***

CARRIER, COLLIERVILLE
CARRIER, NRS CLOSURE PHASE I, 12/96

SW846-VOA	SAMPLE ID ------->	NRS-S-B414-16		NRS-S-B419-21		NRS-S-B424-26		NRS-S-B429-31		NRS-S-B434-36		NRS-C-B434-36	
	ORIGINAL ID ----->	NRSSB41416		NRSSB41921		NRSSB42426		NRSSB42931		NRSSB43436		NRSCB43436	
	LAB SAMPLE ID --->	28048.19		28048.13		28048.10		28048.16		28048.21		28048.20	
	ID FROM REPORT -->	NRSSB41416		NRSSB41921		NRSSB42426		NRSSB42931		NRSSB43436		NRSCB43436	
	SAMPLE DATE ----->	12/19/96		12/19/96		12/19/96		12/19/96		12/19/96		12/19/96	
	DATE ANALYZED --->	12/26/96		12/31/96		12/27/96		12/30/96		12/26/96		12/26/96	
	MATRIX ---------->	Soil		Soil		Soil		Soil		Soil		Soil	
	UNITS ---------->	UG/KG		UG/KG		UG/KG		UG/KG		UG/KG		UG/KG	
CAS #	Parameter	28048	VAL	28048	VAL	28048	VAL	28048	VAL	28048	VAL	28048	VAL
74-87-3	Chloromethane	12.	U	54.	UJ	10.	UJ	53.	UJ	10.	U	10.	U
74-83-9	Bromomethane	12.	U	54.	UJ	10.	UJ	53.	UJ	10.	U	10.	U
75-01-4	Vinyl chloride	12.	U	54.	UJ	10.	UJ	53.	UJ	10.	U	10.	U
75-00-3	Chloroethane	12.	U	54.	UJ	10.	UJ	53.	UJ	10.	U	10.	U
75-09-2	Methylene chloride	4.	J	89.	J	22.	J	26.	UJ	3.	J	3.	J
67-64-1	Acetone	410.	DJ	1600.	D	12.	J	410.	J	49.	J	590.	DJ
75-15-0	Carbon disulfide	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
75-35-4	1,1-Dichloroethene	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
75-34-3	1,1-Dichloroethane	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
540-59-0	1,2-Dichloroethene (total)	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
67-66-3	Chloroform	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
107-06-2	1,2-Dichloroethane	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
78-93-3	2-Butanone (MEK)	12.	U	54.	UJ	10.	UJ	53.	UJ	10.	U	10.	U
71-55-6	1,1,1-Trichloroethane	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
56-23-5	Carbon tetrachloride	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
75-27-4	Bromodichloromethane	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
78-87-5	1,2-Dichloropropane	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
10061-01-5	cis-1,3-Dichloropropene	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
79-01-6	Trichloroethene	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
124-48-1	Dibromochloromethane	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
79-00-5	1,1,2-Trichloroethane	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
71-43-2	Benzene	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
10061-02-6	trans-1,3-Dichloropropene	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
75-25-2	Bromoform	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	12.	U	54.	UJ	10.	UJ	53.	UJ	10.	U	10.	U
591-78-6	2-Hexanone	12.	U	54.	UJ	10.	UJ	53.	UJ	10.	U	10.	U
127-18-4	Tetrachloroethene	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
79-34-5	1,1,2,2-Tetrachloroethane	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
108-88-3	Toluene	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
108-90-7	Chlorobenzene	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
100-41-4	Ethylbenzene	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
100-42-5	Styrene	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
1330-20-7	Xylene (total)	6.	U	27.	UJ	5.	UJ	26.	UJ	5.	U	5.	U
108-05-4	Vinyl acetate	12.	U	54.	UJ	10.	UJ	53.	UJ	10.	U	10.	U
110-75-8	2-Chloroethyl Vinyl Ether	12.	U	54.	UJ	10.	UJ	53.	UJ	10.	U	10.	U

*** Validation Complete ***

CARRIER, COLLIERVILLE
CARRIER, NRS CLOSURE PHASE I, 12/96

SW846-VOA	SAMPLE ID ------>	NRS-S-B439-41		NRS-S-B444-46	
	ORIGINAL ID ----->	NRSSB43941		NRSSB44446	
	LAB SAMPLE ID --->	28048.15		28048.18	
	ID FROM REPORT -->	NRSSB43941		NRSSB44446	
	SAMPLE DATE ----->	12/19/96		12/19/96	
	DATE ANALYZED --->	12/27/96		12/26/96	
	MATRIX ---------->	Soil		Soil	
	UNITS ----------->	UG/KG		UG/KG	

CAS #	Parameter	28048	VAL	28048	VAL
74-87-3	Chloromethane	10.	UJ	10.	U
74-83-9	Bromomethane	10.	UJ	10.	U
75-01-4	Vinyl chloride	10.	UJ	10.	U
75-00-3	Chloroethane	10.	UJ	10.	U
75-09-2	Methylene chloride	22.	J	5.	U
67-64-1	Acetone	60.	J	140.	J
75-15-0	Carbon disulfide	5.	UJ	5.	U
75-35-4	1,1-Dichloroethene	5.	UJ	5.	U
75-34-3	1,1-Dichloroethane	5.	UJ	5.	U
540-59-0	1,2-Dichloroethene (total)	5.	UJ	5.	U
67-66-3	Chloroform	5.	UJ	5.	U
107-06-2	1,2-Dichloroethane	5.	UJ	5.	U
78-93-3	2-Butanone (MEK)	10.	UJ	10.	U
71-55-6	1,1,1-Trichloroethane	5.	UJ	5.	U
56-23-5	Carbon tetrachloride	5.	UJ	5.	U
75-27-4	Bromodichloromethane	5.	UJ	5.	U
78-87-5	1,2-Dichloropropane	5.	UJ	5.	U
10061-01-5	cis-1,3-Dichloropropene	5.	UJ	5.	U
79-01-6	Trichloroethene	5.	UJ	5.	U
124-48-1	Dibromochloromethane	5.	UJ	5.	U
79-00-5	1,1,2-Trichloroethane	5.	UJ	5.	U
71-43-2	Benzene	5.	UJ	5.	U
10061-02-6	trans-1,3-Dichloropropene	5.	UJ	5.	U
75-25-2	Bromoform	5.	UJ	5.	U
108-10-1	4-Methyl-2-Pentanone (MIBK)	10.	UJ	10.	U
591-78-6	2-Hexanone	10.	UJ	10.	U
127-18-4	Tetrachloroethene	5.	UJ	5.	U
79-34-5	1,1,2,2-Tetrachloroethane	5.	UJ	5.	U
108-88-3	Toluene	5.	UJ	5.	U
108-90-7	Chlorobenzene	5.	UJ	5.	U
100-41-4	Ethylbenzene	5.	UJ	5.	U
100-42-5	Styrene	5.	UJ	5.	U
1330-20-7	Xylene (total)	5.	UJ	5.	U
108-05-4	Vinyl acetate	10.	UJ	10.	U
110-75-8	2-Chloroethyl Vinyl Ether	10.	UJ	10.	U

*** Validation Complete ***

CARRIER, COLLIERVILLE
CARRIER, NRS CLOUSURE PHASE I, 12/96
Solid Samples - Hits Only

SW846-VOA													
	SAMPLE ID ------>	NRS-S-B104-06		NRS-S-B109-11		NRS-S-B114-16		NRS-S-B119-21		NRS-S-B124-26		NRS-S-B129-31	
	ORIGINAL ID ----->	NRSSB10406		NRSSB10911		NRSSB11416		NRSSB11921		NRSSB12426		NRSSB12931	
	LAB SAMPLE ID --->	28048.01		28048.02		28048.03		28048.07		28048.09		28048.05	
	ID FROM REPORT -->	NRSSB10406		NRSSB10911		NRSSB11416		NRSSB11921		NRSSB12426		NRSSB12931	
	SAMPLE DATE ----->	12/18/96		12/18/96		12/18/96		12/18/96		12/18/96		12/18/96	
	DATE ANALYZED --->	12/30/96		12/27/96		12/27/96		12/27/96		12/27/96		12/27/96	
	MATRIX ---------->	Soil		Soil		Soil		Soil		Soil		Soil	
	UNITS ----------->	UG/KG		UG/KG		UG/KG		UG/KG		UG/KG		UG/KG	
CAS #	Parameter	28048	VAL	28048	VAL	28048	VAL	28048	VAL	28048	VAL	28048	VAL
74-87-3	Chloromethane												
74-83-9	Bromomethane												
75-01-4	Vinyl chloride												
75-00-3	Chloroethane												
75-09-2	Methylene chloride	3.	J	10.	J	12.	J	24.	J	25.	J	25.	J
67-64-1	Acetone			19.	J	16.	J	19.	J	19.	J	23.	J
75-15-0	Carbon disulfide												
75-35-4	1,1-Dichloroethene												
75-34-3	1,1-Dichloroethane												
540-59-0	1,2-Dichloroethene (total)												
67-66-3	Chloroform												
107-06-2	1,2-Dichloroethane												
78-93-3	2-Butanone (MEK)												
71-55-6	1,1,1-Trichloroethane												
56-23-5	Carbon tetrachloride												
75-27-4	Bromodichloromethane												
78-87-5	1,2-Dichloropropane												
10061-01-5	cis-1,3-Dichloropropene												
79-01-6	Trichloroethene							45.	J				
124-48-1	Dibromochloromethane												
79-00-5	1,1,2-Trichloroethane												
71-43-2	Benzene												
10061-02-6	trans-1,3-Dichloropropene												
75-25-2	Bromoform												
108-10-1	4-Methyl-2-Pentanone (MIBK)												
591-78-6	2-Hexanone												
127-18-4	Tetrachloroethene												
79-34-5	1,1,2,2-Tetrachloroethane												
108-88-3	Toluene												
108-90-7	Chlorobenzene												
100-41-4	Ethylbenzene												
100-42-5	Styrene												
1330-20-7	Xylene (total)												
108-05-4	Vinyl acetate												
110-75-8	2-Chloroethyl Vinyl Ether												

*** Validation Complete ***

CARRIER, COLLIERVILLE
CARRIER, NRS CLOUSURE PHASE I, 12/96
Solid Samples - Hits Only

SW846-VOA													
	SAMPLE ID ------>	NRS-S-B134-36		NRS-S-B139-41		NRS-S-B144-46		NRS-S-B204-06		NRS-S-B209-11		NRS-S-B214-16	
	ORIGINAL ID ----->	NRSSB13436		NRSSB13941		NRSSB14446		NRSSB20406		NRSSB20911		NRSSB21416	
	LAB SAMPLE ID --->	28048.06		28048.08		28048.04		28043.02		28043.01		28043.03	
	ID FROM REPORT -->	NRSSB13436		NRSSB13941		NRSSB14446		NRSSB20406		NRSSB20911		NRSSB21416	
	SAMPLE DATE ----->	12/18/96		12/18/96		12/18/96		12/19/96		12/19/96		12/19/96	
	DATE ANALYZED --->	12/27/96		12/27/96		12/27/96		12/23/96		12/23/96		12/23/96	
	MATRIX ---------->	Soil		Soil		Soil		Soil		Soil		Soil	
	UNITS ---------->	UG/KG		UG/KG		UG/KG		UG/KG		UG/KG		UG/KG	
CAS #	Parameter	28048	VAL	28048	VAL	28048	VAL	28043	VAL	28043	VAL	28043	VAL
74-87-3	Chloromethane												
74-83-9	Bromomethane												
75-01-4	Vinyl chloride												
75-00-3	Chloroethane												
75-09-2	Methylene chloride	24.	J	27.	J	6.	J						
67-64-1	Acetone	4.	J	18.	J	14.	J	5.	J	64.			
75-15-0	Carbon disulfide												
75-35-4	1,1-Dichloroethene												
75-34-3	1,1-Dichloroethane												
540-59-0	1,2-Dichloroethene (total)												
67-66-3	Chloroform												
107-06-2	1,2-Dichloroethane												
78-93-3	2-Butanone (MEK)												
71-55-6	1,1,1-Trichloroethane												
56-23-5	Carbon tetrachloride												
75-27-4	Bromodichloromethane												
78-87-5	1,2-Dichloropropane												
10061-01-5	cis-1,3-Dichloropropene												
79-01-6	Trichloroethene	1.	J	2.	J			160.		11.		130000.	J
124-48-1	Dibromochloromethane												
79-00-5	1,1,2-Trichloroethane							6.	J				
71-43-2	Benzene												
10061-02-6	trans-1,3-Dichloropropene												
75-25-2	Bromoform												
108-10-1	4-Methyl-2-Pentanone (MIBK)												
591-78-6	2-Hexanone												
127-18-4	Tetrachloroethene												
79-34-5	1,1,2,2-Tetrachloroethane												
108-88-3	Toluene							2.	J				
108-90-7	Chlorobenzene												
100-41-4	Ethylbenzene												
100-42-5	Styrene												
1330-20-7	Xylene (total)							5.	J				
108-05-4	Vinyl acetate												
110-75-8	2-Chloroethyl Vinyl Ether												

*** Validation Complete ***

CARRIER, COLLIERVILLE
CARRIER, NRS CLOUSURE PHASE I, 12/96
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SW846-VOA													
	SAMPLE ID ------>	NRS-C-B214-16		NRS-S-B219-21		NRS-S-B224-26		NRS-S-B229-31		NRS-S-B234-36		NRS-S-B239-41	
	ORIGINAL ID ----->	NRSCB21416		NRSSB21921		NRSSB22426		NRSSB22931		NRSSB23436		NRSSB23941	
	LAB SAMPLE ID --->	28043.04		28043.10		28043.08		28043.05		28043.09		28043.06	
	ID FROM REPORT -->	NRSCB21416		NRSSB21921		NRSSB22426		NRSSB22931		NRSSB23436		NRSSB23941	
	SAMPLE DATE ----->	12/19/96		12/19/96		12/19/96		12/19/96		12/19/96		12/19/96	
	DATE ANALYZED --->	12/23/96		12/20/96		12/20/96		12/23/96		12/23/96		12/20/96	
	MATRIX ---------->	Soil		Soil		Soil		Soil		Soil		Soil	
	UNITS ---------->	UG/KG		UG/KG		UG/KG		UG/KG		UG/KG		UG/KG	
CAS #	Parameter	28043	VAL	28043	VAL	28043	VAL	28043	VAL	28043	VAL	28043	VAL
74-87-3	Chloromethane												
74-83-9	Bromomethane												
75-01-4	Vinyl chloride												
75-00-3	Chloroethane												
75-09-2	Methylene chloride												
67-64-1	Acetone							260.		710.		140.	
75-15-0	Carbon disulfide												
75-35-4	1,1-Dichloroethene												
75-34-3	1,1-Dichloroethane												
540-59-0	1,2-Dichloroethene (total)												
67-66-3	Chloroform												
107-06-2	1,2-Dichloroethane												
78-93-3	2-Butanone (MEK)												
71-55-6	1,1,1-Trichloroethane												
56-23-5	Carbon tetrachloride												
75-27-4	Bromodichloromethane												
78-87-5	1,2-Dichloropropane												
10061-01-5	cis-1,3-Dichloropropene												
79-01-6	Trichloroethene	14000.	J	13.		4.	J	10.	J	43.		17.	
124-48-1	Dibromochloromethane												
79-00-5	1,1,2-Trichloroethane												
71-43-2	Benzene												
10061-02-6	trans-1,3-Dichloropropene												
75-25-2	Bromoform												
108-10-1	4-Methyl-2-Pentanone (MIBK)												
591-78-6	2-Hexanone												
127-18-4	Tetrachloroethene												
79-34-5	1,1,2,2-Tetrachloroethane												
108-88-3	Toluene												
108-90-7	Chlorobenzene												
100-41-4	Ethylbenzene												
100-42-5	Styrene												
1330-20-7	Xylene (total)												
108-05-4	Vinyl acetate												
110-75-8	2-Chloroethyl Vinyl Ether												

*** Validation Complete ***

CARRIER, COLLIERVILLE
CARRIER, NRS CLOUSURE PHASE I, 12/96
Solid Samples - Hits Only

Su846-VOA	SAMPLE ID ------>	NRS-S-B244-46	NRS-S-B304-06	NRS-S-B309-11	NRS-S-B314-16	NRS-S-B319-21	NRS-S-B324-26
	ORIGINAL ID ----->	NRSSB24446	NRSSB30406	NRSSB30911	NRSSB31416	NRSSB31921	NRSSB32426
	LAB SAMPLE ID --->	28043.07	28043.18	28043.14	28043.16	28043.15	28043.13
	ID FROM REPORT -->	NRSSB24446	NRSSB30406	NRSSB30911	NRSSB31416	NRSSB31921	NRSSB32426
	SAMPLE DATE ----->	12/19/96	12/19/96	12/19/96	12/19/96	12/19/96	12/19/96
	DATE ANALYZED --->	12/20/96	12/23/96	12/23/96	12/26/96	12/23/96	12/26/96
	MATRIX ---------->	Soil	Soil	Soil	Soil	Soil	Soil
	UNITS ---------->	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG	UG/KG

CAS #	Parameter	28043	VAL	28043	VAL	28043	VAL	28043	VAL	28043	VAL	28043	VAL
74-87-3	Chloromethane												
74-83-9	Bromomethane												
75-01-4	Vinyl chloride												
75-00-3	Chloroethane												
75-09-2	Methylene chloride							5.	J				
67-64-1	Acetone					6.	J	28.	J			37.	J
75-15-0	Carbon disulfide												
75-35-4	1,1-Dichloroethene												
75-34-3	1,1-Dichloroethane												
540-59-0	1,2-Dichloroethene (total)												
67-66-3	Chloroform												
107-06-2	1,2-Dichloroethane												
78-93-3	2-Butanone (MEK)												
71-55-6	1,1,1-Trichloroethane												
56-23-5	Carbon tetrachloride												
75-27-4	Bromodichloromethane												
78-87-5	1,2-Dichloropropane												
10061-01-5	cis-1,3-Dichloropropene												
79-01-6	Trichloroethene	58.		8.		17.		83.		1100.		10.	
124-48-1	Dibromochloromethane												
79-00-5	1,1,2-Trichloroethane			2.	J								
71-43-2	Benzene												
10061-02-6	trans-1,3-Dichloropropene												
75-25-2	Bromoform												
108-10-1	4-Methyl-2-Pentanone (MIBK)												
591-78-6	2-Hexanone												
127-18-4	Tetrachloroethene												
79-34-5	1,1,2,2-Tetrachloroethane												
108-88-3	Toluene												
108-90-7	Chlorobenzene												
100-41-4	Ethylbenzene												
100-42-5	Styrene												
1330-20-7	Xylene (total)							2.	J				
108-05-4	Vinyl acetate												
110-75-8	2-Chloroethyl Vinyl Ether												

*** Validation Complete ***

CARRIER, COLLIERVILLE
CARRIER, NRS CLOUSURE PHASE I, 12/96
Solid Samples - Hits Only

SW846-VOA													
	SAMPLE ID ------>	NRS-S-B329-31		NRS-S-B334-36 RE		NRS-S-B339-41		NRS-S-B344-46		NRS-S-B404-06		NRS-S-B409-11	
	ORIGINAL ID ----->	NRSSB32931		NRSSB33436		NRSSB33941		NRSSB34446		NRSSB40406		NRSSB40911	
	LAB SAMPLE ID --->	28043.20		28043.17		28043.21		28043.19		28048.17		28048.14	
	ID FROM REPORT -->	NRSSB32931		NRSSB33436		NRSSB33941		NRSSB34446		NRSSB40406		NRSSB40911	
	SAMPLE DATE ----->	12/19/96		12/19/96		12/19/96		12/19/96		12/19/96		12/19/96	
	DATE ANALYZED --->	12/23/96		12/23/96		12/23/96		12/23/96		12/26/96		12/30/96	
	MATRIX ---------->	Soil		Soil		Soil		Soil		Soil		Soil	
	UNITS ---------->	UG/KG		UG/KG		UG/KG		UG/KG		UG/KG		UG/KG	
CAS #	Parameter	28043	VAL	28043	VAL	28043	VAL	28043	VAL	28048	VAL	28048	VAL
74-87-3	Chloromethane												
74-83-9	Bromomethane												
75-01-4	Vinyl chloride												
75-00-3	Chloroethane												
75-09-2	Methylene chloride							3.	J			13.	J
67-64-1	Acetone	7.	J			9.	J			350.	J	1200.	J
75-15-0	Carbon disulfide												
75-35-4	1,1-Dichloroethene												
75-34-3	1,1-Dichloroethane												
540-59-0	1,2-Dichloroethene (total)							3.	J				
67-66-3	Chloroform												
107-06-2	1,2-Dichloroethane												
78-93-3	2-Butanone (MEK)												
71-55-6	1,1,1-Trichloroethane												
56-23-5	Carbon tetrachloride												
75-27-4	Bromodichloromethane												
78-87-5	1,2-Dichloropropane												
10061-01-5	cis-1,3-Dichloropropene												
79-01-6	Trichloroethene			210.	J	3.	J	130.		21.			
124-48-1	Dibromochloromethane												
79-00-5	1,1,2-Trichloroethane							2.	J				
71-43-2	Benzene												
10061-02-6	trans-1,3-Dichloropropene												
75-25-2	Bromoform												
108-10-1	4-Methyl-2-Pentanone (MIBK)												
591-78-6	2-Hexanone												
127-18-4	Tetrachloroethene												
79-34-5	1,1,2,2-Tetrachloroethane												
108-88-3	Toluene			2.	J								
108-90-7	Chlorobenzene												
100-41-4	Ethylbenzene												
100-42-5	Styrene												
1330-20-7	Xylene (total)			5.	J								
108-05-4	Vinyl acetate												
110-75-8	2-Chloroethyl Vinyl Ether												

*** Validation Complete ***

CARRIER, COLLIERVILLE
CARRIER, NRS CLOUSURE PHASE I, 12/96
Solid Samples - Hits Only

SW846-VOA													
	SAMPLE ID ------>	NRS-S-B414-16		NRS-S-B419-21		NRS-S-B424-26		NRS-S-B429-31		NRS-S-B434-36		NRS-C-B434-36	
	ORIGINAL ID ----->	NRSSB41416		NRSSB41921		NRSSB42426		NRSSB42931		NRSSB43436		NRSCB43436	
	LAB SAMPLE ID --->	28048.19		28048.13		28048.10		28048.16		28048.21		28048.20	
	ID FROM REPORT -->	NRSSB41416		NRSSB41921		NRSSB42426		NRSSB42931		NRSSB43436		NRSCB43436	
	SAMPLE DATE ----->	12/19/96		12/19/96		12/19/96		12/19/96		12/19/96		12/19/96	
	DATE ANALYZED --->	12/26/96		12/31/96		12/27/96		12/30/96		12/26/96		12/26/96	
	MATRIX ---------->	Soil		Soil		Soil		Soil		Soil		Soil	
	UNITS ---------->	UG/KG		UG/KG		UG/KG		UG/KG		UG/KG		UG/KG	
CAS #	Parameter	28048	VAL	28048	VAL	28048	VAL	28048	VAL	28048	VAL	28048	VAL
74-87-3	Chloromethane												
74-83-9	Bromomethane												
75-01-4	Vinyl chloride												
75-00-3	Chloroethane												
75-09-2	Methylene chloride	4.	J	89.	J	22.	J			3.	J	3.	J
67-64-1	Acetone	410.	DJ	1600.	D	12.	J	410.	J	49.	J	590.	DJ
75-15-0	Carbon disulfide												
75-35-4	1,1-Dichloroethene												
75-34-3	1,1-Dichloroethane												
540-59-0	1,2-Dichloroethene (total)												
67-66-3	Chloroform												
107-06-2	1,2-Dichloroethane												
78-93-3	2-Butanone (MEK)												
71-55-6	1,1,1-Trichloroethane												
56-23-5	Carbon tetrachloride												
75-27-4	Bromodichloromethane												
78-87-5	1,2-Dichloropropane												
10061-01-5	cis-1,3-Dichloropropene												
79-01-6	Trichloroethene												
124-48-1	Dibromochloromethane												
79-00-5	1,1,2-Trichloroethane												
71-43-2	Benzene												
10061-02-6	trans-1,3-Dichloropropene												
75-25-2	Bromoform												
108-10-1	4-Methyl-2-Pentanone (MIBK)												
591-78-6	2-Hexanone												
127-18-4	Tetrachloroethene												
79-34-5	1,1,2,2-Tetrachloroethane												
108-88-3	Toluene												
108-90-7	Chlorobenzene												
100-41-4	Ethylbenzene												
100-42-5	Styrene												
1330-20-7	Xylene (total)												
108-05-4	Vinyl acetate												
110-75-8	2-Chloroethyl Vinyl Ether												

*** Validation Complete ***

CARRIER, COLLIERVILLE
CARRIER, NRS CLOUSURE PHASE I, 12/96
Solid Samples - Hits Only

SW846-VOA			
	SAMPLE ID ------->	NRS-S-B439-41	NRS-S-B444-46
	ORIGINAL ID ----->	NRSSB43941	NRSSB44446
	LAB SAMPLE ID --->	28048.15	28048.18
	ID FROM REPORT -->	NRSSB43941	NRSSB44446
	SAMPLE DATE ----->	12/19/96	12/19/96
	DATE ANALYZED --->	12/27/96	12/26/96
	MATRIX ---------->	Soil	Soil
	UNITS ----------->	UG/KG	UG/KG

CAS #	Parameter	28048	VAL	28048	VAL
74-87-3	Chloromethane				
74-83-9	Bromomethane				
75-01-4	Vinyl chloride				
75-00-3	Chloroethane				
75-09-2	Methylene chloride	22.	J		
67-64-1	Acetone	60.	J	140.	J
75-15-0	Carbon disulfide				
75-35-4	1,1-Dichloroethene				
75-34-3	1,1-Dichloroethane				
540-59-0	1,2-Dichloroethene (total)				
67-66-3	Chloroform				
107-06-2	1,2-Dichloroethane				
78-93-3	2-Butanone (MEK)				
71-55-6	1,1,1-Trichloroethane				
56-23-5	Carbon tetrachloride				
75-27-4	Bromodichloromethane				
78-87-5	1,2-Dichloropropane				
10061-01-5	cis-1,3-Dichloropropene				
79-01-6	Trichloroethene				
124-48-1	Dibromochloromethane				
79-00-5	1,1,2-Trichloroethane				
71-43-2	Benzene				
10061-02-6	trans-1,3-Dichloropropene				
75-25-2	Bromoform				
108-10-1	4-Methyl-2-Pentanone (MIBK)				
591-78-6	2-Hexanone				
127-18-4	Tetrachloroethene				
79-34-5	1,1,2,2-Tetrachloroethane				
108-88-3	Toluene				
108-90-7	Chlorobenzene				
100-41-4	Ethylbenzene				
100-42-5	Styrene				
1330-20-7	Xylene (total)				
108-05-4	Vinyl acetate				
110-75-8	2-Chloroethyl Vinyl Ether				

*** Validation Complete ***

Appendix D

Statistical Analysis Of Confirmatory Sample Results

CARRIER CVL-NRS CONFIRMATORY BORINGS
Statistical Calculations
Ref: EPA Publication No. SW-846, Third Edition, (Part II), Chapter 9 - Sampling Plan

All Sample Points

TCE (ppb) Xi	(Xi)^2
6	36
6	36
6	36
45	2,025
5	25
6	36
1	1
2	4
5	25
160	25,600
11	121
130000	1.690E+10
13	169
4	16
10	100
9	81
17	289
58	3,364
8	64
17	289
83	6,889
>1100	1.210E+06
10	100
5	25
> 210	44,100
3	9
130	16,900
21	441
60	3,600
6	36
27	729
5	25
26	676
5	25
5	25
5	25

RT	**533**
N	36
df	35
Mean	**3669.167**
S^2	4.690E+08
S	21657.500
S(mean)	3609.583
t(0.05)	1.684
upper CI	**9747.705**
lower CI	-2409.372

N = the number of sample measurements
df = degrees of freedom (N-1)
Mean = average of all possible measurements of variable
S^2 = the variance of the sample
S = the standard deviation of the sample
t(0.05) = students "t" value for a confidence interval and a probability of 0.05
upper CI = upper confidence interval
lower CI = lower confidence interval

To use:
- T statistic
CI
data normally distributed
- characterize region of the hotspot
- probably log normal
use the logarithms → CI
TRANSFORM cleanup # by same logarithm

2/11/97
Representative of some area - composite sample. Make sure not isolated hotspot. Volatiles clearly can't be composited. SUBSAMPLES 20-30' from other samples.

> Think of a Hexagon w/ 130,000 6 points - then remove 130,000 from calculation → equilateral triangles, convenience in field

CARRIER CVL-NRS CONFIRMATORY BORINGS

Statistical Calculations

Ref: EPA Publication No. SW-846, Third Edition, (Part II), Chapter 9 - Sampling Plan

All Sample Points minus outlier

TCE (ppb) Xi	(Xi)^2
6	36
6	36
6	36
45	2,025
5	25
6	36
1	1
2	4
5	25
160	25,600
11	121
13	169
4	16
10	100
9	81
17	289
58	3,364
8	64
17	289
83	6,889
1100	1.210E+06
10	100
5	25
210	44,100
3	9
130	16,900
21	441
60	3,600
6	36
27	729
5	25
26	676
5	25
5	25
5	25

RT	**533**
N	35
df	34
Mean	**59.714**
S^2	3.503E+04
S	187.171
S(mean)	31.638
t(0.05)	1.697
upper CI	**113.403**
lower CI	6.025

N = the number of sample measurements
df = degrees of freedom (N-1)
Mean = average of all possible measurements of variable
S^2 = the variance of the sample
S = the standard deviation of the sample
t(0.05) = students "t" value for a confidence interval and a probability of 0.05
upper CI = upper confidence interval
lower CI = lower confidence interval

CARRIER CVL-NRS CONFIRMATORY BORINGS

Statistical Calculations

Ref: EPA Publication No. SW-846, Third Edition, (Part II), Chapter 9 - Sampling Plan

Shallow

	Xi	(Xi)^2
5 ft	6	36
	160	25,600
	8	64
	21	441
10 ft	6	36
	11	121
	17	289
	60	3,600
15 ft	6	36
	6	36
	83	6,889
	130,000	1.690E+10
20 ft	45	2,025
	13	169
	1,100	1,210,000
	27	729

	Xi	(Xi)^2
5 ft	6	36
	160	25,600
	8	64
	21	441
10 ft	6	36
	11	121
	17	289
	60	3,600
15 ft	6	36
	6	36
	83	6,889
20 ft	45	2,025
	13	169
	1,100	1,210,000
	27	729

with outlier		*without outlier*	
RT	**533**	RT	**533**
N	16	N	15
df	15	df	14
Mean	**8223.063**	Mean	**104.600**
S^2	1.055E+09	S^2	7.757E+04
S	32474.965	S	278.511
S(mean)	8118.741	S(mean)	71.911
t(0.05)	1.753	t(0.05)	1.761
upper CI	**22455.216**	upper CI	**231.235**
lower CI	-6009.091	lower CI	-22.035

N = the number of sample measurements
df = degrees of freedom (N-1)
Mean = average of all possible measurements of variable
S^2 = the variance of the sample
S = the standard deviation of the sample
t(0.05) = students "t" value for a confidence interval and a probability of 0.05
upper CI = upper confidence interval
lower CI = lower confidence interval

CARRIER CVL-NRS CONFIRMATORY BORINGS

Statistical Calculations

EPA Publication No. SW-846, Third Edition, (Part II), Chapter 9 - Sampling Plan

Deep

	Xi	(Xi)^2
25 ft	5	25
	4	16
	10	100
	5	25
30 ft	6	36
	10	100
	5	25
	26	676
35 ft	1	1
	9	81
	210	44,100
	5	25
40 ft	2	4
	17	289
	3	9
	5	25
45 ft	5	25
	58	3,364
	130	16,900
	5	25

RT	**533**
N	20
df	19
Mean	**26.050**
S^2	2.752E+03
S	52.455
S(mean)	11.729
t(0.05)	1.729
upper CI	**46.330**
lower CI	5.770

N = the number of sample measurements
df = degrees of freedom (N-1)
Mean = average of all possible measurements of variable
S^2 = the variance of the sample
S = the standard deviation of the sample
t(0.05) = students "t" value for a confidence interval and a probability of 0.05
upper CI = upper confidence interval
lower CI = lower confidence interval

Appendix E

Residual TCE Mass Calculations

NRS mass calculations - TCE remaining in soil

SB1

pth-ft	*volume-cu ft**	*soil type*	*density-lb/cu ft*	*TCE conc-ppb*		*mass*	
5	8945	clayey-silt	100	6		0.0054	
10	8945	silty clay	100	6		0.0054	
15	8945	sandy clay	100	6		0.0054	
20	8945	sand	130	45		0.0524	
25	8945	sand	130	5		0.0058	
30	8945	sand	130	6		0.0070	
35	8945	sand	130	1		0.0012	
40	8945	sand/gravel	140	2		0.0025	
45	8945	sand/gravel	140	5		0.0063	
					total	0.0913	lbs

SB2

depth-ft	*volume-cu ft*	*soil type*	*density-lb/cu ft*	*TCE conc-ppb*		*mass*	
5	9000	clayey-silt	100	160		0.1442	
10	9000	silty clay	100	11		0.0099	
15	9000	sandy clay	100	130000		117.1406	
20	9000	sand	130	13		0.0152	
25	9000	sand	130	4		0.0047	
30	9000	sand	130	10		0.0117	
35	9000	sand	130	43		0.0504	
40	9000	sand/gravel	140	17		0.0214	
45	9000	sand/gravel	140	58		0.0732	
					total	117.4713	lbs

SB3

depth-ft	*volume-cu ft*	*soil type*	*density-lb/cu ft*	*TCE conc-ppb*		*mass*	
5	7130	clayey-silt	100	8		0.0057	
10	7130	silty clay	100	17		0.0121	
15	7130	sandy clay	100	83		0.0593	
20	7130	sand	130	1100		1.0208	
25	7130	sand	130	10		0.0093	
30	7130	sand	130	5		0.0046	
35	7130	sand	130	210		0.1949	
40	7130	sand/gravel	140	3		0.0030	
45	7130	sand/gravel	140	130		0.1299	
					total	1.439635	lbs

SB4

depth-ft	*volume-cu ft*	*soil type*	*density-lb/cu ft*	*TCE conc-ppb*		*mass*	
5	7955	clayey-silt	100	21		0.0167	
10	7955	silty clay	100	30		0.0239	
15	7955	sandy clay	100	6		0.0048	
20	7955	sand	130	27		0.0280	
25	7955	sand	130	5		0.0052	
30	7955	sand	130	26		0.0269	
35	7955	sand	130	5		0.0052	
40	7955	sand/gravel	140	5		0.0056	
45	7955	sand/gravel	140	5		0.0056	
					total	0.121778	lbs
					NRS total	**119.1239**	lbs

SB2 small area**

depth-ft	*volume-cu ft*	*soil type*	*density-lb/cu ft*	*TCE conc-ppb*		*mass*	
15	1570.8	sandy clay	100	130000		20.4449	

Equation used to calculate mass:

'cubic ft of study area) x (density of soil type, lb/cu ft) x (TCE conc., ppb) x (1 x 10^-6) x (kg/2.2 lb) x (lb/454 g)

* Areas around each boring were found by dividing entire NRS area into 4 separate areas around each boring. Volume was found by multiplying the area by the sample depth interval (5 ft).

** SB2 small area volume taken from the potential area of stagnation as shown on Fig. 1. The area was found (314.14 sq ft), and multiplied by depth of contaminated area (5 ft) to get a volume of 1570.8 cubic feet.